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EDITORIAL.

Rice Production in Malaya.

The recent publication of the Report of the Rice Cultivation Committee directs attention once more to the very important subject of the desirability of producing, within Malaya, a much greater proportion of the internal requirements of this essential foodstuff.

His Excellency, Sir Cecil Clementi, in his speech at the opening of the Malayan Exhibition last year, drew attention to this subject and instanced the experience of British Guiana, which has been converted from a rice-importing country into a rice-exporting country, with advantage to the Colony.

During times of prosperity in Malaya, rice-consumers have usually been in a position to pay the price demanded for imported rice, but there has always been the fear, which was realised between 1919—21, that supplies might fail owing to a general rice shortage. There is no guarantee that a similar condition of affairs will not re-occur at any time.

At the present time, large stocks of rice are held by the main exporting countries, causing a considerable fall in prices. The benefit of this fall in price is lessened by the lower purchasing power of consumers in Malaya.

Furthermore, we fully expect a recovery of rice prices directly trade in other directions becomes more normal. There is also an undoubted tendency for many Eastern nations to produce a smaller proportion of their requirements for their increasing population. This will become accentuated in the future owing to the growth of industrialism in the East. On the other hand, the amount of exportable rice from the main rice-producing countries tends, in normal times, to increase at a slower rate than the foreign demand.

It behoves Malaya, therefore, to place a limit to the uncertainty which is inseparable with the present situation in this respect.

The Report indicates that there is no one scheme of rice production which will provide a solution to this problem; but that salvation lies in the adoption of many proposals detailed in the Report, some small, others more ambitious, but all designed to adapt the conditions peculiar to various parts of the country to the successful cultivation of rice.

Demonstrations to Chinese.

In order that the peasant cultivators might profit by the results of appropriate research work of the Department, instructions and demonstrations among Chinese small holders in Selangor has been regularly undertaken since early in 1930.

Among methods adopted to achieve this object is the organisation of conducted parties at the Government Experimental Plantation, Serdang, where the results obtained as a result of research work can be actually seen and the benefits appreciated.

At the commencement, the instruction was confined to Chinese market gardeners, but soon had to be extended to meet the demands of all classes of Chinese agriculturists, who were not slow in appreciating the advantages to be derived when such were presented in a manner that they were capable of interpreting.

During the period from May to December, 1930, 159 Chinese agriculturists were conducted over the Plantation in small parties, in charges of the technical officer concerned.

The practical results of this work are now becoming evident in such directions as the planting of good fodder grass for carp rearing; in silt pitting, cover cropping, improved pruning and manurial trials on tea areas; the introduction of improved strains of yams in shops patronised by Europeans; the grading up of local pigs by using pure bred boars from the Plantation; manurial experiments on coffee; the use of artificial fertilisers on vegetables and the more cordial relationship between the Department and the Chinese small agriculturist.

Dairying in Malaya.

It is an incontestable fact that stock raising on the plains of Malaya offers difficulties which are of less importance in most other countries. The immediate problems in connection with milk production are concerned with suitable feeding and the protection of stock against disease. These questions require even closer attention in the case of imported stock, for such animals frequently suffer from a lowering of vitality which, together with the change of diet, renders them more prone to disease. Even apart from the influence of change of climate, there is no doubt that many imported breeds are more susceptible to disease than are the local or the cross bred stock.

Research is therefore necessary on the local cultivation of foodstuffs suitable for stock, for unless the stockman can rely on locally grown foodstuffs for the greater part of the requirements of his herd, it will be most difficult to conduct such a venture on a profitable basis except by charging a very high price for the produce.

Consideration of the breeds most suitable for importing into Malaya has occupied the attention of this Department as well as private persons. It is not claimed that the final word has been said on this subject, but it is claimed that considerable advance have been made.

As stated above, imported stock are generally more susceptible to disease than are locally bred or cross-bred stock. At the same time, the advantages of

pure bred stock are so apparent that every effort should be made towards their acclimitisation.

The Singapore Cold Storage Co., Ltd., by the establishment of a dairy and pig farm in Singapore, has added materially to the accumulating data on this subject and it is therefore with pleasure that we include in this number of the *Malayan Agricultural Journal* an account of the general lines on which they have worked and of the results to date.

We hope in the near future to supplement this information by accounts of other work of an experimental nature conducted by the Department of Agriculture, so that the public may have available complete information to guide them in inaugurating similar ventures on an economic basis.

The Malayan Pineapple Trade.

From time to time, attention has been drawn in this Journal to the very important industry which exists in Malaya in the growing and canning of pineapples. The extent of this trade and the strong position it holds on the United Kingdom market may be gathered from the article included in this number.

It is an open secret that a local Conference has been considering the question of Malayan pineapple industry with a view to recommending methods by means of which it may be placed in a firmer position and may be extended.

We do not wish to anticipate the recommendations of the Conference, so refrain from comment at the present juncture, but we would point out that the information published in this number, together with the articles which appeared in this Journal during the year 1930, read in conjunction with the report of the Conference, will be found most useful to students of this subject.

Coffee Arabica.

The opening up of Cameron Highlands has brought into prominence a selection of crops suitable for the climate. We have attempted to place before readers, not only information of the experimental work which is being conducted at that station, but an account of the crops suitable for cultivation at that altitude. Consequently, articles have already been published on tea and cardamoms, and we now include an article on Coffee which should be of value to those who contemplate agricultural enterprise at Cameron Highlands. We would also mention that the Department has in preparation a full account of tea growing and manufacture written by Mr. E. A. Curtler, Assistant Agriculturist, who investigated this subject last year in Ceylon and India.

In connection with the agricultural development of Cameron Highlands, emphasis must be made of the paramount necessity of using every endeavour to prevent soil erosion. The general experience in Ceylon has been that methods with this object have usually been adopted too late. Readers, and particularly those interested in agriculture at Cameron Highlands, are referred to the Ceylon Report of the Committee on Soil Erosion, a review of which appears in the next number of this Journal.

Original Articles.

A SINGAPORE PIG AND DAIRY FARM.

BY

T. D. MARSH,

Assistant Agriculturist.

Introductory.

For some years past The Singapore Cold Storage Co. has been engaged in pig-raising with the primary object of marketing carcases of first class quality and killed at weights similar to those offered for sale in Europe. Such carcases are small and suit the European community in-so-much as the proportion of lean to fat is high. The business is now being extended to cater for the Chinese, who prefer pork from heavier and more mature animals.

Many difficulties were encountered in the initial stages, including introduced disease which caused heavy losses, but the solution of each problem has added to the accumulation of valuable information on this branch of animal husbandry. The farm is conducted on sound methods and most of the early troubles have been surmounted.

During the year 1930 an extension in the agricultural activities of the Company included the establishment of a small dairy herd with the object of producing milk of grade A quality.

The fresh milk supply of Malaya is produced in small dairies chiefly under the control of Indians, the class of cattle kept being mostly nondescript mixtures of Indian breeds, and Murra buffaloes. The methods employed, the buildings that are used to house the cattle, the inferiority of the water supplies, combined with the general lack of the requisite knowledge of modern dairy practice, almost preclude the possibility of the production of high grade milk. In consequence, these dairymen do not enjoy the confidence of the educated classes of the country in the quality of their output, with the result that the public favour the purchase of the imported tinned article. Although such milk may lack certain vitamins, owing to the sterilisation processes through which it has passed, it is nevertheless a clean wholesome food.

The imports in the form of sweetened and unsweetened condensed, natural sterilized, and powdered milk, have grown to a large amount and the value of these imports into Malaya exceeded $13,000,000 during the year 1930.

The Managing Director of the Company realised that there was a demand for fresh milk and in spite of many failures in Malaya in the past by both Europeans and Asiatics to maintain profit-producing dairy herds, the Company has imported European cattle of the Friesian breed with a view to establishing a dairy herd on Singapore Island.

The venture bids fair to become successful in spite of the very severe conditions for introduced breeds of cattle and pigs. It must be realised that this farm is established on the plains only 3 degrees north of the equator. It is probable

that this and the Government Dairy at Serdang, Selangor, are the only instances of established dairies of European stock situated under such intense tropical conditions. Even in Java with the same breed of cattle, it is invariably the custom to maintain the pure breeds on the Highlands, only the cross-bred European and Asiatic cattle, which are more resistant to tropical diseases, being used in diary farms on the lowlands.

Policy.

The policy of the Company is :—

(1) To develop a pig farm having a total number of about 10,000 animals.

(2) To maintain a dairy farm at Singapore to test the effect of tropical conditions over a period, on imported Friesian cattle and if the stock can be kept in a healthy and productive condition it is proposed to :—

(a) Continue the importation of stock and breed from them with a view to the selection of the most hardy and productive animals.

(b) Later, if considered advisable, to establish a stud stock farm at Cameron Highlands for the breeding of high class stock for use on the plains. This farm will also be used as a convalescent station for cattle which are suffering from the effects of the lowland climate.

(c) To establish dairy farms in the vicinity of all large towns of the Peninsula for the production of large quantities of high grade milk for sale to hospitals and to the general public.

The Farms.

The first pig farm was established about 6½ miles from Singapore on the Bukit Timah Road. The soil consists of a yellow clay loam, which puddles badly when wet and bakes during dry weather.

This farm is fairly well protected from the sun by the usual "kampong" shade formed by fruit trees, which has been augmented by perhaps a too liberal planting of West Indian Cherry trees, *Muntingia calabura*. The farm is now carrying about 2,500 pigs.

Owing to the insecurity of tenure and the limited area, 60 acres of virgin jungle land for a second farm for both pigs and cattle was acquired in 1929.

This farm is situated on the Bukit Timah Road about 9¼ miles from Singapore. The land is undulating with a deep gully running through, which carried a stream of excellent water before anti-malarial measures were undertaken. The soil is a well drained fertile loam and overlies granite rocks.

On three sides the area is surrounded by jungle and on the fourth by mature rubber. It is unlikely that the adjacent land will be alienated for agricultural purposes, so that there is little likelihood of squatters commencing stock farming in the vicinity with the consequent danger of introducing disease.

Feeding.

About three-fourths of the area has been clean cleared and planted with Guinea grass, *Panicum maximum,* and Elephant grass, *Pennisetum* sp.; these grasses are showing remarkable growth. A crop of about two tons of green fodder is harvested daily from about 18 acres of grass, which is a very heavy yield. Another grass which appears to be a promising fodder is Kikuyu grass, *Pennisetum clandestinum.*

The balance of the area is fenced and sub-divided, the jungle has been felled, but the secondary growth is allowed to develop to provide shade for the pigs.

The Elephant grass is cut at intervals of eleven days, whilst the Guinea grass is cut every five days. By this method of early cuttings, the harvested grass contains a high percentage of proteins and a low percentage of fibre, which is specially suitable for pig feeding. Grass cut at this stage of growth acts as a mild laxative, which is considered beneficial, particularly under tropical conditions.

In addition to the above liberal supplies of grass fed to all animals, concentrated foods are given, and a certain amount of imported foodstuffs from England.

No special foods are given except separated milk powder, which is used as a food for weaned litters. It is considered that the fresh grass contains sufficient vitamins and most of the mineral salts for all classes of stock.

The foods are not cooked with the exception of a partial sterilisation before shipment of those imported from England. A fairly narrow albuminoid ratio is used. Fish, meat, whale meal or offal are not included in the rations, while the proportion of cereals is kept low as it is considered that these foods are too heating.

Water Supply.

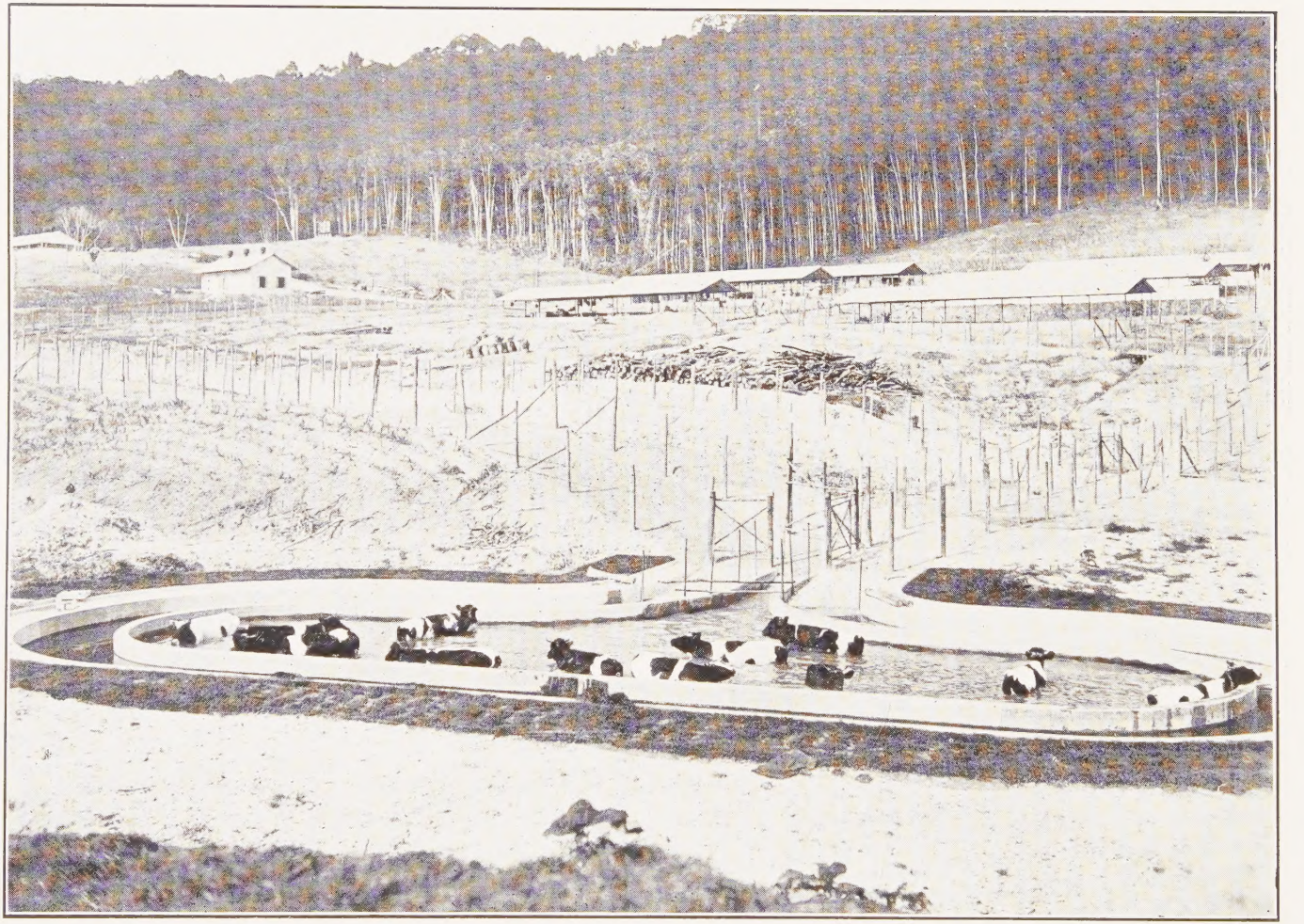
One of the factors which influenced the selection of the area was the purity and quantity of water flowing through the land; it was considered that this would provide a cheap supply for all the needs of the farm. Owing to a severe outbreak of malaria while the jungle was being cleared, extensive anti-malarial drainage measures were found to be necessary.

The water supply of the farm and the drainage of the ravines were combined in a general scheme which included the laying of 5 inch sub-soil drains at an average depth of 5½ feet; these drains were laid at the foot of the hills and along the centre of some of the ravines. At the head of the largest gully the pipe drains conduct the water to an underground reservoir which is built above the area that may possibly be contaminated with drainage water from the stock buildings. From this reservoir water is pumped to a large tank situated on a hill, which permits the supply by gravitation to all parts of the farm.

The principal catchment area is on a very steep hill outside the farm boundary.

Water for cleaning purposes runs direct from the high elevation tank to the various buildings, whilst that used for drinking purposes is gravitated to a

Panoramic view of the area planted with fodder grasses.



FRIESIAN CATTLE HAVING THEIR DAILY BATH. THE OUTSIDE BATH IS SEPARATE FROM THE INSIDE ONE, IS SHALLOWER AND IS USED EXCLUSIVELY FOR PIGS.

second storage tank from which it is conducted by pipes to the stock sheds and open yards. The water in this tank is chlorinated daily by the addition of "Caporit" and occasionally a little potassium iodide is added.

Baths.

The overflow from the underground reservoirs with the water from other drains is used to fill large concrete baths of an original design, separate tanks being used for cattle and pigs. The water level in these baths can be regulated to suit the class of stock using the baths.

The cattle bath can be filled to a maximum depth of about four feet, whilst the pig bath is limited to about two feet. The stock are allowed to stay in the water for 15 to 20 minutes and they are given two or three baths per day according to the weather.

Attendants are on duty all day both in the baths and driving pigs to and fro. A system of races is constructed so that all the pigs on the farm can enter the race leading to the bathing tank and return by another passage to their pen. In this way mixing of bathed and unbathed pigs is obviated.

The cattle, on their return to the shed, pass through a shallow concrete tank about six inches deep containing a mild disinfectant, and sows in-milk pass through a similar tank to disinfect their udders; adhering eggs of parasites or the actual parasites are in this way destroyed.

Health.

The health of all types of stock appears to be excellent and the Farm Manager states that internal and external parasites in his stock are negligible. He claims that there are no ticks on his cattle; and in general, parasites now cause no material damage, although in the past they have proved troublesome.

"Caporit," a proprietary preparation of chloride of lime, is used as a general disinfectant for all purposes and also for chlorinating the drinking water. This preparation is claimed to be superior to the ordinary commercial article.

A sick pig is at once removed from the herd to the Isolation Hospital, while if there is a doubt about the disease the animal is slaughtered for examination and the carcase destroyed as a first precaution against the spread of infectious or contagious diseases.

Swine fever serum is always kept in cold storage in readiness should an outbreak occur. In the past some trouble was caused by "three weeks diarrhoea", which occurs in suckling pigs at this age. This has been prevented by painting the navels with iodine at birth and once every few hours afterwards, and by using a "Caporit" udder bath for the mothers. All buildings are limewashed once every two weeks with a spraying machine, 4 to 5 ounces of "Caporit" being added to each 3 gallons of lime wash. As a blue wall is said to be repulsive to flies an excess of blue is added so that when dry it gives the limewash a deep blue colour.

Drainage.

The farm at the 9th mile has been sub-soil drained under the supervision of the Anti-malarial Department and all the gullies are dry except for occasional storm water.

The system from the cattle sheds and pig styes is of open concrete drains, so that cleaning is facilitated. These drains discharge into a water course at the lowest point on the boundary of the farm.

Fences.

Fences are constructed of woven wire 2½ feet high of about 16 gauge galvanised wire, which costs about $180/- per mile. Six-foot posts are used so that another 2½ feet of wire can be placed above if it is found necessary. A strand of barbed wire is placed about 3 inches from the ground in open pig yards to prevent the pigs from lifting the fence. The woven wire is placed about 1 foot from the ground in the case of cattle fences, thus making the top wire of the fence about 3½ feet high.

Disposal of Manure.

The attendants collect manure from the cattle shed and pigstyes continuously; this is stored throughout the day in a covered tank on wheels. It is throughly mixed each day with small quantities of lime, "Caporit," superphosphate, sulphate of potash and sulphate of ammonia, in a concrete mixer and buried in the grass land. It is stated that the addition of sulphate of ammonia prevents the breed-of flies; possibly the interaction of the lime and sulphate of ammonia liberates free amonia which prevents the flies from laying their eggs.

Feeding of Minerals.

The feeding to farm animals of large quantities of fresh succulent grass grown on virgin land with the help of liberal dressings of artificial manure should provide practically all the mineral salts necessary for the bodily functions of farm stock, but as the feeding of minerals in the rations of all farm animals has during the past few years given striking results, additional mineral salts comprising phosphates, lime, iron, sodium, potassium and iodine are added. The mixture is prepared on the farm and is fed in smaller quantities than the usual 2 per cent. of concentrated food consumed.

The Farm Manager claims that liberal feeding of minerals to the native Chinese pigs from the time they are weaned will cause them to stand more upright on their fetlocks and their backs will have a much straighter top line than the usual hollow backs seen in pigs in Chinese holdings.

FRIESIAN CATTLE IN THE BYRE SHOWING THE FEEDING TROUGHS, AUTOMATIC WATER BOWLS, AND FEEDING PASSAGE

The electrically driven vacuum cleaner being used on a Friesian cow; the machine is carried by the attendant.

The Pig Farm.

The stock at present on the two farms is more than 2,500 head.

The breeds used are Large White Yorkshire crossed with Chinese native sows. As the stock tends to become too close to the Yorkshire type, that is after three or four generations, a good type cross-bred boar (Large White Yorkshire x native) is used to infuse more or the native blood into the progeny.

These crosses have been very successful; the sows are very prolific and make good mothers. The native Chinese pigs have characteristics that do not permit them to compete in this particular market with pigs having a fair proportion of an admixture of the leaner European breeds. The native sow has the tendency to become too fat, and most of them when in-milk drag the udder along the ground far more than do the cross-bred with the consequent risk of picking up parasites on the teats for the litter to swallow.

Black pigs are not favoured by the Manager and should a sow persist in having litters with black a dominant colour, this trait is sufficient to have her culled from the herd even if she is quite good otherwise.

The general endeavour is to breed with the object of producing a long lean active white pig, fairly close to the large Yorkshire type, having a wide head, well sprung ribs, deep chest, with light shoulders, but heavy hind quarters and good wide loins. All stock are kept in a fairly lean condition until they are put into the fattening pens. It is the custom to allow undergrown weaners to stay with their mother for a week or two longer than the stronger pigs.

A stud of pure Large White Yorkshires is being maintained, segregated from the herd, to provide boars for the whole farm. Tamworths and Middle Whites have been tried, but the latter are too fat for the market and the former are considered to be inferior to the Yorkshire.

It is proposed to introduce the improved "Dutch Land Race" of pigs. This is a popular breed in north-west Continental Europe and has many of the characteristics of the Large White Yorkshire.

Experiments have been tried with crossing other native breeds, and even the wild pig of Malaya has been used. It was thought that the wild pig might have greater disease resisting qualities than the domestic breeds. A strain of the wild pig can now be observed in many of the breeding sows.

The pigs for the European market are killed at a live weight of about 100 lbs. giving a carcase of about 60 lbs., whereas the pigs for the Chinese market are killed to give a carcase up to one picul (133⅓ lbs.)

Importations of stock are made in the form of pregnant sows, mature gilts of the desired type being purchased in England. They are mated to a good boar and shipped about one month later, so that the exporter can be practically certain that the sows are pregnant. In this way a mature sow and litter is imported at a reasonable price. The voyage does not appear to harm the sows, which still have to carry their litters a further two months after arrival in Malaya. By this method the litters have a better chance of becoming acclimatised;

consequently they make better stud animals than imported mature stock which often suffer from the effects of the heat.

Housing.—Various types of styes have been tried, from temporary wooden portable sheds to semi-permanent wooden, and concrete and iron buildings. The type favoured at present is constructed of concrete walls 3 feet high and 4 inches thick, reinforced with woven wire, with two inch angle-irons to support a roof of galvanised iron. No wood enters into the construction of the styes as it is considered that wood harbours parasites, is more difficult to keep hygienic and is less durable.

The size of the pens for all purposes is 10 feet by 7½ feet, the supports are 6 feet high to the eaves and 10 feet to the apex of the gable. Ten such pens are under one roof and they are built in a continuous row. The Manager states that attendants do not ordinarily traverse a shed more than once during their tour of inspection and one row of styes in each shed will be observed more thoroughly than two. The sheds which are spaced 30 feet apart, are built on the slope of a hill and are arranged with the gables facing North and South.

Floors.—Many experiments have been tried to construct a non-damp conducting floor, asphalt alone and mixed with cork being used in different ways. The type of floor favoured after many trials consists of concrete with a layer of impervious felt paper placed 2 to 3 inches below the surface. The brand of paper used is "Pabco building paper"; water-proof cement being used for the top rendering. Guard rails of 1½ inch pipes, situated about 9 inches from the walls and 6 inches high, are used in farrowing pens to prevent the sows from lying on their newly-farrowed pigs.

A passage 6 feet wide on one side of the pen and under the roof is provided so that the total width of the framework of the building is 16 feet, an overhang of the roof of about 3 feet being allowed on each side. Upright supports for the roof are spaced 15 feet apart, that is, in the alternate walls of the pens, the gables being open to the apex of the roof.

Feeding troughs in the pens are made of concrete and lined with white glazed tiles; the inside measurements for each trough are 2 feet long, 4 inches deep and 6 inches wide. It has been observed that mature Large White Yorkshire pigs can conveniently feed from these troughs, but they would probably be too small for short nosed breeds.

Feeding.—This subject has been dealt with in the general remarks on all stock on the farms under this heading.

Open Yards.—At the new farm large runs are fenced and occupied by breeding sows, open sheds being provided in each enclosure.

The carrying capacity of the land is calculated at the rate of 50 to 75 pigs per acre, but each area is periodically rested for at least a month.

The stock is provided with a continuous supply of drinking water, the level of which is controlled in the troughs by ball cocks.

In order to save labour costs, dry feeding of the pigs is practised. Auto-

matic feeders are installed which only permit fresh food being supplied as the previous deliveries are consumed.

In the open yards a certain amount of secondary jungle is allowed to grow to provide shade for the animals.

Stud Boars.—The stud boars are kept in separate yards, which are about one quarter of an acre in extent, an open shed being provided for each boar. The stud boars are segregated from the sows and are used for service with a herd of sows not more often than one day every two weeks.

Labour.—All the employees on the farm are Chinese. The labourers are grouped together for easier working; the work of each man is the complete care of 100 growing pigs, or a similar task with other classes of stock. As the new farm is being built on more modern labour-saving plans, it is considered that an attendant will be able to take complete care of a much greater number of pigs.

General Remarks.—Although heavy losses have occurred in the past due to mistakes and disease, the results to date are sufficiently encouraging to cause the Company to embark on a larger scale of development with a fair capital outlay.

The Farm Manager is confident that he has overcome most of the dangers of the business of pig raising in the tropics, while the carcases produced are filling a demand as far as production at present allows. There is always the possibility of the introduction of dangerous diseases, but the methods adopted are directed to prevent an outbreak on the farm, or an incursion from outside.

The Dairy Farm.

Many importations of dairy cattle, mostly from Australia, have been made in the past with the object of keeping the animals on the plains, and with the hope of being able, by the sale of milk during the first lactation period after arrival, to pay off the capital charges connected with the purchase and transport of the animals to Malaya. It must be mentioned that some people were prepared to lose money on these importations, provided they could obtain a good supply of fresh milk over a fair period.

Many of these importations succumbed to red water fever a short time after landing, others have survived one lactation period, but few have exceeded this time, until the Government imported cattle for the stocking of the dairy farm at the Government Experimental Plantation, Serdang, where for the past 18 months European cattle have proved successful.

The Singapore Cold Storage Co., during October and November, 1930 imported seven British Friesian cows and one bull from England, and 5 Friesian cows from the Java Highlands. Since their arrival in Singapore 4 heifer calves and one bull calf have been calved. All these cattle at the present time are in a sound state of health, the cows are giving a very satisfactory yield of milk, while the calves can be described as being in admirable condition. The importation of pure-bred Ayrshire stock is under consideration.

Housing.—The cattle are housed continuously except for half an hour

morning and evening when they are having baths, and also one hour each in the mornings and afternoons when they are turned into an open yard for sun baths and exercise.

The house is built of reinforced concrete, angle iron standards and corrugated iron sheets. Special flexible glass panels, which permit the passage of ultra violet rays, are built into the roof.

The outside walls are of concrete and are 4 feet 6 inches high with an open space above of 3 feet 6 inches to the eaves, the ridge is about 13 feet high and is surmounted with three "Robinsons patent ventilators" to a twelve-stalled shed. The shed appears to be exceptionally cool. At the end is a foot bath containing a mild disinfectant, through which all the cattle must pass on entering the shed.

A room about 15 feet x 15 feet is included at one end of the building as a calving shed, or for use as a sick bay for non-contagious diseases. Only one row of stalls is accommodated in the shed.

The byre is fitted with the modern type steel stanchions. Automatic water bowls are fitted to the stalls; each bowl has its own valve which is operated by the animal as water is required.

Dimensions of Stalls.—At the head of the cows is a feeding passage 3 feet 9 inches wide. The inside width of the feeding trough is 2 feet 6 inches, the depth of the back of the trough, i.e. adjoining the feeding passage, is 2 feet 2 inches whilst the depth immediately in front of the stanchions is 10 inches. The back of the feeding trough is semi-circular in shape but the front is vertical. The length of the stalls from the trough to the manure channel is 4 feet 9½ inches. The channel is 18 inches wide and 6 inches deep, with a deeper portion at the side furthest from the cows' heels. A passage 4 feet wide at the rear of the cows is included, which is built on a lower level than that of the stalls.

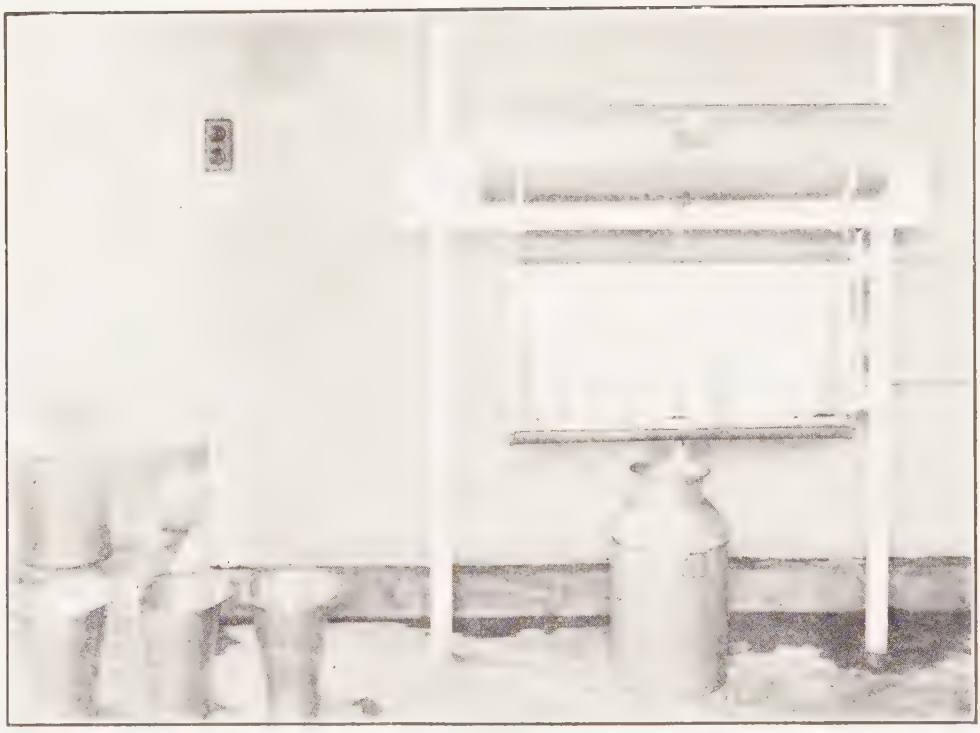
The feeding troughs are of concrete and are continuous throughout the whole length of the feeding passage, with moveable spring loaded divisions which separate the trough into lengths equal to the stall widths, which are 3 feet 6 inches. These divisions pivot on a hinge and can readily be lifted for rapid cleansing of the feeding trough. Ordinarily they separate each cow's food from that of its neighbour.

The floors are constructed of concrete with a layer of impervious building paper laid in the concrete about 2 to 3 inches below the surface. A mixture of cement and salt is occasionally painted on the surface to make it less slippery. Trials with cork-asphalt bricks are being made; the results show that this material is not sufficiently durable. A feature worthy of note is that there are in the building no right-angled corners; they are all rounded to facilitate cleaning.

Bedding.—Feeding grass or "lalang grass" is used which has been disinfected with a spray of "Caporit" in water. The bedding is dried before use.

Machinery.—The following is a brief description of the plant and machinery installed on the dairy farm:—

The electric milking machine showing also the stalls, steel stanchions and feeding troughs.



THE MILK FLOWING OVER THE COOLER IMMEDIATELY AFTER BEING DRAWN.

(1) A separate engine and pump is used to lift the water to the high level storage tank from the underground reservoir, which is situated in the ravine.

(2) The dairy plant consists of a vertical Petter engine and dynamo, which generates current for electric light, power for the electric milking machines, and vacuum cleaner.

(3) A refrigerating plant is installed and run by the Petter engine with a chamber having inside dimensions of about 8 feet x 6 feet x 5 feet and capable of storing the milk for one milking of 200 cows.

The brine circulating pipes of this plant are connected to the milk cooler which is installed outside but adjacent to one of the walls of the refrigerating chamber.

Milking.—Before milking is commenced the floors are all damped, so that dust is less likely to get into the milk after it is drawn. The udders are washed with common soap and a mild solution of "Caporit" in water. The first milk is drawn by hand and is allowed to fall on the floor as the end of the teat invariably contains a large colony of bacteria, which would be sufficient to raise considerably the bacterial count in the milk, after which the machines are fixed on to the teats.

The cows are milked at 5 a.m., 12 noon and 8 p.m. daily. Each cow's milk is weighed on a yard-arm balance in preference to the usual spring scales; the yield so far has been very satisfactory. The milk, as soon as it is drawn, is carried to the milk room, where it is filtered and passed over the cooler; this reduces the temperature to about 35°F. It is then placed in the refrigeration chamber, which maintains an even temperature of about 40°F. It is later transported in bulk to the Central Depot in Singapore, where it is bottled for the retail trade, all handling being carried out under European supervision. The present retail price is 30 cents per pint.

According to the tests made by the Health authorities, this milk compares most favourably with grade A milk in England, the bacterial count varying between 2,500 and 6,000 per cc. which is remarkably low. The butter fat averages about 3.5 per cent.

A departure from standard practice is the method of cleansing and the sterilization of milk utensils, no steam being used. This is carried out with the agency of chlorine solution in water obtained from the favourite disinfectant "Caporit". The results, as shown by the bacterial count, prove that the system is efficient. Tests by bacterial count and carried out in comparison with steam sterilization in the bottling room in Singapore have shown that the chlorine-water solution is the more efficient method.

All the milk utensils are the latest type of seamless articles which facilitates cleaning.

Grooming.—The cows, in addition to having a bath morning and evening, are daily groomed with a special electric vacuum cleaner which massages, cleans

and brushes the skin. All the dirt is collected in a bag, and thus one of the sources of dust is eliminated.

For wounds or sores the proprietary antiseptic "Monsol" is used. Iodine is painted on the navels of calves at birth and again a few hours afterwards.

Labour.—The work is carried out by Chinese who quickly adapt themselves to the conditions and also to the degree of cleanliness required. At present three men do all work of the farm day and night, but the task on a large dairy farm would be much greater.

Feeding.—Feeding is dealt with earlier in the article, but it may be added that the calves are fed on dry "storeletts"which is an imported special proprietary mixture for calf feeding. The mature animals are fed on a balanced ration. The ration might be changed at any time with the fluctuations of market prices. Fresh grass *ad lib* is fed three times daily.

Dipping.—So far it has been found unnecessary to instal a cattle dip, other methods adopted having proved successful in keeping out ticks and other external parasites.

General.—Assuming that dairy cattle in the tropics are correctly housed, fed and generally cared for, their successful maintenance appears to depend upon the complete prevention of attacks on the animals by disease carrying parasites.

The trying effect of a tropical climate on European breeds of cattle is also a serious drawback, but this might be mitigated by the use of a convalescent hill farm to which individual cattle, suffering from the effects of the climate, could be temporarily transferred for recuperation. So far the cows in this dairy have been free from anaplasmosis (gall sickness) and piroplasmosis, (red water fever) which are tick-borne diseases, the latter having in the past caused almost 100 per cent. mortality in imported European breeds; exceptional precautions are incessantly taken to keep the stock free from both external and internal parasites. It will be interesting to observe over an extended period, the effects of a tropical climate on imported European stock which are maintained absolutely free from ticks.

The Company, and in particular the Farm Manager, are to be congratulated on the results so far achieved. Great determination has been shewn in the constant vigil against parasites and no less so in the adoption of suitable modern methods in all branches connected with the development of the Dairy and Pig Farms.

The author takes this opportunity of acknowledging the very great assistance given to him in the preparation of this article by the Singapore Cold Storage Co., and in this connection would especially thank the Managing Director, and the Farm Manager.

The accompanying illustrations were kindly supplied by The Singapore Cold Storage Co., Ltd.

COFFEE IN SOUTH INDIA*

BY

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Assistant Agriculturist.

South Indian coffee is grown at about 4,000 feet above sea-level. The soil is of medium texture and contains a little laterite, the slopes are not usually very steep, but the general lie of the land is hilly. Most of the coffee appears to be in a healthy condition.

Arabica coffee is the chief variety cultivated in South India. There are also areas of hybrid varieties known locally as "Robusta" although some of the leaves are of the large dark Liberian type; the fruits are in clusters as in the Robusta type, but larger than the Robusta usually grown in Malaya. The older fields are all planted with Arabica seed imported from Mysore, but practically all the new planting is "Kent's Arabica."

The Arabian bush is much more uniform and symmetrical than are the varieties grown on the plains. It has one main central shoot from which the primaries grow parallel with the ground, the secondaries being almost at right angles in the same plane. The "Kent's Arabica" is a very similar bush, but the branches tend to grow in a more upward direction than the Mysore variety and curve over at the ends.

The "Robusta" is usually allowed to grow unchecked and becomes a large bush as much as fifteen feet high, the branches spreading out so that they overlap from about eight feet above the ground.

Planting.

Basket plants are much preferred to "stumps" as they develop very much better in the field and average four inches at two years old instead of only three as in the case of "stumps", while the general appearance of the basket plants also indicates that they are more vigorous. Another objection to stump planting is that as many as 40 per cent. may die off shortly after planting out.

The planting distance on all estates is 8 feet by 8 feet square at which distance the mature bushes of Arabica just touch, but the "Robusta" intermingle.

The only form of cultivation is the digging of trenches along the spaces between the rows regardless of the contour of the land. These trenches are 18 inches deep, 18 inches wide and usually about 34 feet long, unless there is a natural obstacle such as a rock or a shade tree. If an artificial stop is left it is from 3 to 4 feet long.

The trenches are either cut in alternate spaces and left till they are full of débris, when fresh trenches are cut in the other alternate spaces, or they are cut

*The following is part of the author's report on an official tour of six months in Ceylon and India in 1930.

in every fourth space. In the latter case it is usual to cut a fresh set of trenches each year, so that every space is dug over once in four years. Owing to the porous nature of the soil there are no signs of the overflow from these trenches starting streams down the hill.

Weeding.

The weeding is done by hand or with scrapers. It is essential that the blades be not long enough for the tools to be used sideways and the handles only just long enough to obtain sufficient leverage to remove the roots of the weeds from the soil.

During the monsoons it is usual to hand pull only the big weeds so that the small weeds assist in checking soil erosion; scrapers are only used between the monsoons. As a result of this light weeding, the fields are dirty by the end of the south-west monsoon. During the drought preceding the break of the south-west monsoon practically all the weed growth is killed with the result that "Dry wash" frequently starts.

Shade.

It is quite usual to see coffee grown under jungle shade, all trees of eighteen inches diameter and over being left when the jungle is felled for planting. After completion of the felling, groups of big trees are thinned out so that there is a fairly even stand of shade throughout the field. Some of the coffee growing under jungle shade is of excellent appearance.

The shade tree most commonly planted is *Grevillea robusta,* which grows very well. The planting distance varies between 15 and 25 feet square, the most usual being 20 feet. Closer planting makes the shade rather too close and results in less vigorous growth of the coffee. The object is to create a complete shade, but not so dense as to be definitely dark.

The Grevilleas are often topped at between 18 and 20 feet and kept at that height to encourage the trees to branch. The shade requires to be kept well above the bushes so that it does not "draw" the coffee.

The wild Jack Fruit (*Artocarpus sp.*) is considered to be a suitable tree for shade in coffee. On one estate dadaps (*Erythrina spp.*) were interplanted with the Grevilleas. These trees are topped in September or October, the branches being placed between the rows of coffee. Some of the old dadaps, 40 to 50 feet high, were still looking healthy and being topped annually.

Pruning.

The Arabian variety is usually topped at 4 feet 6 inches. If a bush has been cut back too low, or if the head is broken off, a new shoot is allowed to grow till the brown wood is just below the correct height, at which point it is cut back at the correct height.

The centre of the bush, for 9 inches all round the main stem, is kept open to allow entrance of light and air. With this object in view the bushes are ex-

amined thrice annually, about April, during the south-west monsoon (July—August) and again in October just before harvesting commences. All secondaries within the area are removed and at the same time any suckers from the base are cut off.

The actual pruning is carried out early in the year, when all secondaries growing upward from the primaries and those which cross are cut out; at the same time, any others that have not a good show of flowering buds are removed. Any branch that has started to "die back" is also cut off just in front of the outside living bud.

The pruning system on one estate is as follows:—

If the lower primaries start to die off, the strongest basal sucker is left on the bush and allowed to remain till it attains the correct height for topping. When it is topped, the old stem is cut off just above the base of the sucker so that the old bush is entirely removed and the sucker becomes the main stem of a new bush. This practice is not general since some planters consider that bushes, on which the lower primaries die, should be cut out and replaced by supplies from the nursery.

Harvesting.

In South India coffee flowers from March until May and the bulk of the crop is ripe in November and December; a few odd berries ripen during October and the harvest usually continues into January.

As a general rule, the bushes are not allowed to carry a crop till they are in their fifth year, but some of the more forward bushes may be allowed to carry a small crop during the third year. The primaries are not allowed to carry any crop, all flowers and small fruits being rubbed off when the centre of the bush is cleaned out during the flowering season.

The berries are collected as soon as they are a deep red colour, the fields being gone through as frequently as may be economically possible with the available labour force. The crop per acre varies between 4½ and 5 cwts. per annum.

Manuring.

The coffee is usually manured twice a year, in April and in October. For the first application, the dressing is 2 cwts. per acre and for the second it is increased to 3 cwts. On some estates even more than this is normally given, but owing to the low price of coffee in 1930 manuring had been considerably reduced and in some places entirely omitted.

The mixture is sent up by the Agents ready for application so that no exact details as to its ingredients were available. It is generally a complete mixture with nitrogen in the form of sulphate of ammonia, phosphate as bone meal and potash as nitrate of potash.

The manure mixture is applied in a small trench scraped out with the hand, below the perimeter of the branches on the upper side of each bush. Each labourer has a tin which, when full, holds enough manure for one bush and he spreads the manure evenly along the trench previously opened out, then covers

the mixture with a thin layer of soil. This work requires to be closely watched to make certain that the correct amount of manure is applied per acre, since with 680 bushes per acre, a small error in the amount applied per bush becomes an appreciable error in the aggregate.

Pests and Diseases.

Although the coffee berry borer (*Cryphalus hampei*) is common at the lower elevations in South India, it has not yet attacked the up-country areas. In fact, no serious pest was brought to the writer's notice.

The coffee leaf disease (*Hemileia vastatrix*) is common, particularly during October, but the attacks are not virulent. The Mysore variety of coffee is more liable to attack than is "Kent's Arabica," but in no case was the disease serious. It is usual to spray any diseased bush with Bordeaux mixture, but the estimate for this work is frequently reduced or cut out by the Agents.

Occasionally, a case of black leaf rot (*Corticium Koleroga*) occurs. The effect of this disease is to turn all the leaves black and they subsequently fall off the bushes, sometimes collecting together and forming "birds' nests" among the branches.

This disease should be controlled by the collection and burning of all attacked leaves and branches. Bordeaux mixture effectively controls this disease as well as *H. vastatrix*.

Manufacture.

The site for the coffee store, as it is commonly called, should be as high up on the estate as possible, provided that there is an adequate supply of water, a ready access to a road and a sufficient slope so that the pulp can be carried out of the store by gravity assisted by the flow of water.

The water supply must be constant and should be as clean as possible. In order to ensure an ample supply, the ravine down which the stream comes is dammed at a suitable spot to form a reservoir, from which the water can be drawn if the stream runs too slowly. The reservoir also acts as a catch pit for any stones or débris that may be brought down by the stream. To ensure that no stones or débris are carried into the factory, at least three pits must be provided in the duct, while beyond each pit there must be a piece of wire-netting placed across the duct to hold up any leaves or light material held in suspension.

The only machine used in the factory is a coffee pulper, which removes the outer coat from the fruit. This is done by squeezing the fruits between a stationery and a rotating surface. The most common type of machine is one with a narrow wheel of about 30 inches in diameter, with indentations which carry the fruit along and squeeze it against an inclined plane. The more modern type of machine has a cylinder at the bottom of the hopper which squeezes out the berries from the fruits against an adjustable breast, which can be set according to the size of the fruits that are being pulped. The larger machines of this type are fitted with rotary screens which separate the half-pulped fruits from

those that have been pulped clean. This machine is more efficient than the previously mentioned type which allows half-pulped fruits to pass.

With both types of machines the fruits are carried through by a stream of water, which afterwards flows away with the pulp in suspension, hence the need for a good supply of clean water to the factory.

As mentioned previously, the store should be on the side of a hill, so that the fruit may be brought into the upper floor of the factory at the higher end and stored there. The pulpers are placed on the floor with a shoot leading from the storage room to the machines. The water duct and fruit should be close together, so that one attendant can control the flow of both the machines.

The berries from the pulpers are carried into a fermenting tank, which should be large enough to hold a maximum day's crop when filled to within six inches of the top.

On the up-country estates it is usual to have four fermenting tanks, since at altitudes of between 3,500 and 4,000 feet it is not always possible to obtain a satisfactory fermentation in three days.

The beans are allowed to remain in the fermenting tank till every particle of the mucilaginous layer has been removed by rubbing with the feet of the labourers.

When the berries have been sufficiently fermented they are floated off into the washing tank, which should be twice the area of the fermenting tank and have a separate supply of clean water flowing into it. Beyond the main washing tank is a smaller tank into which all the small and broken berries are floated to keep them separate from the main lot, as their presence in the main part of the crop considerably reduces its market value.

After the berries have been thoroughly washed, they are sun-dried. The drying may be done either on a cement barbecue or on hessian spread over a framework of lathes about three feet from the ground. The latter method has the advantage that it allows a current of air to pass under the beans thus expediting the drying process. If a barbecue is used it should have a convex surface so that all the water can run off rapidly after a shower of rain.

When the beans are thoroughly dry they are packed in sacks for despatch to the dealers.

A shed should be provided at a considerably lower level than the floor of the washing tank. In this shed a conical or pyramidcal frame is erected, which will hold back pulp but allow water to drain through. The pulp from the machines is washed down over the frame and left to drain, as is also the refuse from the fermenting tanks. At the end of the cropping season this pulp is mixed with dadap toppings or other vegetable matter and chemical manures, then kept under cover in the form of a compost for use as a coffee manure in the following October.

THE BAMBARRA GROUND-NUT IN KEDAH

BY

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The Bambarra ground-nut (*Voandzeia subterranea,* Thou) known locally as 'Kachang Poi' or 'Kachang Manila' has been grown for several years past on a small scale in different parts of Kedah, but recently increased interest has been taken in this tropical African leguminous plant particularly in the Kulim District, where quite a considerable acreage is now planted annually, principally by Chinese market gardeners. Recently, in one locality alone, plots of the crop were inspected which had a total area of over 13 acres.

Although small trials have occasionally been made in experiment stations, no previous account of this ground-nut and its cultivation on a commercial scale in Malaya, has been published locally, so that this brief note may be of interest.

The plant is an annual and bears numerous erect long-petioled tri-foliate leaves which are produced from small short creeping stems, whilst the small yellowish coloured flowers are borne on these stems quite close to the ground, and like those of the common ground-nut (*Arachis hypogaea* L.), the flower-stalks lengthen in a downward direction after the flowers have been fertilized and gradually push the young pods under the ground around and below the plants, where they ripen.

The thick mass of foliage which is produced completely covers the ground, even when the plants are spaced two feet or more apart, so that weeds give very little trouble in cultivation.

The class of soil which appears to be most suitable for the crop is a well-drained, sandy loam. Before the seeds are sown the land is well cultivated and levelled. If the soil is rather heavy, ridges about 4 feet apart are sometimes made and the plants grown on these. The usual spacing of the plants on areas with light soil is 2 feet to 2 feet 3 inches square. Two seeds are sown in each hole and the plants mature their small round single-seeded pods in from 3 to 4 months from the time of sowing.

In harvesting the crop, the entire plants are pulled up. The nuts are not easily detached from the plants owing to the tough wiry stalks and very few are left in the ground so that little labour is required for this work.

After reaping, the nuts are hand-picked from the plants, cleaned and sun-dried and then sent to the local market for sale.

The yield of dried unshelled 'nuts' is said to amount to 800 to 1,000 lbs. per acre under suitable conditions and two crops or more can be obtained per annum.

The present retail price in Kedah is 4 cents per kati (1⅓ lbs.) and the nuts are readily purchased both by Chinese and Malays in preference to the common ground-nut, so that all the produce is consumed locally.

The usual local method of preparing the 'nuts' for food is to boil them until they become soft, and shell the beans afterwards. The beans are reported to be of excellent flavour and easily digested and for this reason are much sought after.

In an article published in the *Agricultural Bulletin of the F.M.S.* Vol. 1 No. 7, F. G. Spring stated that seed of the Bambarra nut was imported from Mauritius in September, 1911, and grown in the Experimental Plantation, Kuala Lumpur, but beyond stating that the results were successful, no records are given of yields nor any information regarding the distribution locally of seed obtained. Quoting, however, from an article in the *Tropical Agriculturist* of June, 1911, it is stated that " The yield obtained from the Bambarra ground nut are at least equal to and generally greater than those from the ordinary ground-nut. It is an interesting fact that the composition of the Bambarra ground-nut very closely approaches that of an ordinary normal food ration. Even alone it constitutes a complete food, so that, unlike the others it does not, from this point of view, require mixing with additional foodstuffs. The uses of the plant include the employment of the nut for food, both for human consumption and for stock; the uses of the leaves as fodder and either when fresh or dry, as a " green manure. When the unripe seed is cooked it gives a starchy cum nitrogeneous vegetable, which is much liked, possessing a very agreeable taste somewhat like that of the chestnut. When it is ripe and dry, it may be cooked in the same way as beans and lentils; it does not contain, however, as high a percentage of proteids as these foods. When ground, it yields a very white meal from which excellent broth and soups may be made. Where the fruits are produced in large numbers, they may be used as food for stock; in this case the fact that the covering is consumed as well as the seed gives the product an additional nutritive value."

The Director of Agriculture, S.S. & F.M.S., (Dr. H. A. Tempany) informs the writer that the nut is also a native of Madagascar and that " It is quite extensively grown there and in Mauritius and Reunion for local consumption as a vegetable. It differs from the ordinary ground-nut, *Arachis,* in that it is deficient in oil. The oil-content is under 5 per cent. compared with 20 to 30 per cent. in *Arachis,* it therefore, has no value as an oil-seed for which *Arachis* is chiefly valued as a crop product. In Mauritius it is known as 'Pistache Malgache.' As a vegetable it can be cooked and used in the ordinary way and is in Mauritius also largely used for making soup. As a vegetable it rather resembles Lima beans, but has a curious distinctive earthy flavour which to my mind is rather objectionable."

THE CANNED PINEAPPLE TRADE.*

Imports.

The import into the United Kingdom of canned pineapples in 1929 was nearly 766,000 cwts. as compared with 746,000 cwts. in 1925, but owing to the relatively lower imports during the intervening period the five-yearly average was only some 669,000 cwts., the average import for the period 1920—1924 being 424,000 cwts. In the following tables are shown imports into the United Kingdom since 1925 and the proportions received from the different countries.

Imports of Canned Pineapple into the United Kingdom.

1. Quantities.

COUNTRY	1925	1926	1927	1928	1929	January to October 1930
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
South Africa ...	19,821	22,027	16,017	11,669	13,234	3,422
Malaya ...	604,204	502,065	472,977	514,827	646,952	556,513
Other British ...	2,055	430	2,168	1,384	474	833
Total British ...	626,170	524,522	491,162	527,880	660,660	560,768
U.S.A. and Hawaii.	119,437	83,134	103,735	96,931	101,997	66,731
Other Foreign ...	767	609	1,572	5,271	3,079	5,988
Total Foreign ...	120,204	83,743	105,307	102,202	105,076	72,719
Total Canned Pineapple ...	746,374	608,265	596,469	630,082	765,736	633,487

2. Percentages.

COUNTRY	1925	1926	1927	1928	1929	January to October 1930
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
South Africa ...	2.6	3.6	2.7	1.8	1.7	.5
Malaya ...	80.9	82.5	79.3	81.7	84.4	87.8
Other British ...	.4	.1	.3	.3	.2	.2
Total British ...	83.9	86.2	82.3	83.8	86.3	88.5
U.S.A. and Hawaii.	16.0	13.6	17.4	15.4	13.3	10.5
Other Foreign ...	.1	.2	.3	.8	.4	1.0
Total Foreign ...	16.1	13.8	17.7	16.2	13.7	11.5
Total ...	100.0	100.0	100.0	100.0	100.0	100.0

*The following Memorandum has been prepared by The Empire Marketing Board, to whom we tender our thanks for permission to publish in this Journal.—*Ed. M.A.J.*

It appears from the above tables that the import of pineapples from South Africa is declining both absolutely and relatively, while the proportion of the total supplied by Malaya, in spite of considerable variations in the quantity received during the period under review, is tending to rise. The volume of imports from the United States and Hawaii, and the proportion of the total import also show signs of falling off. It is perhaps too soon to conclude that the declining imports of South African and Hawaiian canned pineapple are a permanent feature of the import position; in both cases the decrease may be due to a temporary fall in the demand for a relatively highly priced article; but it may equally well be due to the general improvement in the quality of the Malayan product.

In 1929, 28.2 per cent. of the total import of all fruits canned in syrup were pineapples as compared with 29.5 per cent. in 1925, the average proportion in the period 1925-29 being 27.5 per cent. as against an average of 28.2 per cent. in the five years 1920 to 1924.

As regards 1930 it seems likely that the proportion of pineapples to other fruits will be higher than in 1928, the reason probably being that the depressed conditions prevailing have caused a comparatively larger demand for the relatively lower priced Malayan supplies which form the bulk of the pineapple imports. Over the ten years ending with 1929, therefore, there has not been much change in the relative position of canned pineapples in the import trade, although the tendency appears to be towards a slight decline. From the consumption standpoint, however, it must be remembered that during that period, and particularly during the past four or five years, the production of English canned fruits has developed to a considerable extent, and the relative decline is therefore more marked than these figures appear to show.

Production Tendencies.

In the following paragraphs statistics of production are reviewed. Exact figures are not available in regard to all sources of supply, but sufficient information is forthcoming as to the most important producing areas to enable a general view of the position to be obtained.

Hawaii. In 1929 the pack of Hawaiian canned pineapple was over 9 million cases and estimates of the 1930 production place the output at nearly 11 million cases, which is appreciably higher than in any previous year. The estimated area in bearing in Hawaii is 50,000 acres, but the American interests which control the industry are known to be seeking further areas in which pineapple canning may be started. This may, in part, be due to the temporary exhaustion of some of the Hawaiian lands, or to the possibility of such a contingency in the future. It has also been suggested that there are signs that production will suffer from the onset of pests, but whatever the reason may be, recent pack statistics do not reveal any decline.

It seems probable in all the circumstances that the production of canned pineapple in Hawaii and other parts controlled by the American concerns will

at least be maintained, and the possibility of an increased output must not be overlooked.

South Africa. Statistics of the production of canned pineapple in South Africa are not given separately in the official statistics. According to the latest figures available the output in 1927-28 of all canned fruits, of which pineapple was probably the largest individual item, was about 60,000 cwts., or approximately 150,000 cases (at a conversion rate of 45 lbs. per case.)

Canned pineapple production in South Africa is comparatively small and there is no indication that the quantity is likely to increase to any great extent in the near future.

Malaya. There are no statistics of the production of Malayan canned pineapple, but total exports give a fair indication of progress and of the extent of the industry. In 1919 a total of 8,200 tons (over 400,000 cases) was exported, and by 1929 the export had risen to nearly 59,000 tons (about 2,900,000 cases).

The whole area under this crop in Malaya is about 50,000 acres, but it appears that less than 5,000 acres of this area is under pineapples as a main crop; in the remainder rubber is the principal crop, and pineapples are planted as a catch crop. As the rubber trees reach maturity pineapples can no longer be grown in this way, and a heavy reduction in output is anticipated unless new lands are opened to cultivation. In view of the importance of the trade every effort is being made to maintain production, and it seems probable that any shrinkage of acreage will be made up by cultivating the pineapple as far as possible as a main crop.

Other Sources of Supply. Among the sources of canned pineapple not already dealt with, Porto Rico, Australia and Formosa especially may be mentioned.

The production of Porto Rico is still comparatively small, but is tending to increase. No statistics of output are available, but as local consumption is negligible, exports to the United States may be taken as a fair indication. In 1928 some 47,000 cases were sent to the mainland; the quantity had risen in 1929 to about 52,000 cases, but in 1930 more than 126,000 cases were shipped.

Pineapple is also canned in Australia, but the pack is largely consumed locally and has not hitherto entered to any great extent into world trade. The 1930 crop in Queensland was large and is reported to be of good quality; some 7,000 cases of the pack were recently shipped to Canada and it is hoped to continue this development on an increasing scale.

Satisfactory progress is also being made in Fiji where two companies have already commenced operations and a third—the largest Hawaiian company—is conducting experiments with a view to production on an extensive scale. The combined annual output of the canneries at present working is small and probably does not exceed 6,000 cases, but a much larger production may be looked for as soon as an adequate supply of fruit is available.

The industry in Formosa is growing fairly rapidly; in 1926 about 5,500 acres were under pineapple cultivation, and by 1929 the area had increased to

over 9,000 acres with 71 factories, which produced over 20 million cans of all sizes, in operation. The greater part of the export trade is with Japan and Korea, but exports to other countries are growing, and last year (1930) for the first time shipments were made to the United Kingdom.

Among other regions in which pineapple canning may be undertaken in the near future may be mentioned the British West Indies and British Guiana, Mauritius and the Philippines, apart from any developments which may take place in Kenya and other African colonies.

It seems fairly clear that on the whole the world output of canned pineapple is likely to increase materially in the next few years.

At the same time, there seems no reason to believe that world consumptive power is likely to fall short of absorbing an increased output. There are still large areas where consumption is comparatively small. Continental Europe, for example, has not so far been a large consumer of canned pineapple; in 1929 exports from the two main sources, Hawaii and Malaya to Europe were appreciably less than one-quarter of the exports to the United Kingdom from these two sources. With a return to normal prosperity the Continent should be able to take a greater share, but against this must be set the fact that local fruit canning industries are being developed in many countries, and since larger supplies of canned pineapple might be considered to react unfavourably on the sale of the local product, the introduction of measures designed to restrict imports may have to be taken into account. Apart, however, from Europe, the markets of the East, notably India and China, are very largely undeveloped and should be capable, in course of time, of taking increasingly greater quantities.

The Position in the United Kingdom Market.

The market is clearly dominated by the supplies from Malaya which are cheap, and are, therefore, accessible to a large public which cannot afford to buy the more expensive Hawaiian and South African product. Malayan pineapple is found in a number of small shops which do not stock any other canned fruits, though it may be noted that the sale of other canned fruits is becoming more usual in this type of shop.

In the past, Malayan pineapple was generally regarded as quite a separate part of the trade; the fruit as a whole was not comparable in quality and grading with the Hawaiian and South African packs, with which, in a certain sense, it did not compete. This is still to a large extent true, and in addition the difference in price tends to separate the two classes; but the improvement which has recently taken place in Malayan pines, together with the advantages of wider publicity, appear to have brought about their introduction into the market hitherto reserved in large part for the Hawaiian and South African types. No doubt this movement has been accentuated by price differences combined with industrial depression, but there is the possibility that if the improvement in quality is maintained the extended market may be retained unless the prices of Hawaiian and South African pineapples are materially reduced.

Reviews.

Report of the Rice Cultivation Committee.

Two Vols. 54 and 196 pp. Federated Malay States Government Press, 1931.

The Rice Cultivation Committee appointed in July of last year has made a most thorough examination of the problems that confront the padi planter in Malaya and the report is a monumental work that should prove an authoritative source to which administrative officers may turn for guidance in the development of rice cultivation in all part of Malaya.

The Committee was appointed for the purpose of considering "what are the best steps to be taken in order to encourage rice cultivation in Malaya." Doubtless the authorities desired to guard against the re-occurrence of a rice-shortage, such as was experienced in 1919-21, by reason of which the Malayan Governments incurred a loss of $42,000,000 in addition to which there were further unascertained losses to employers of labour. Furthermore, the present annual bill for imported rice amounting to $66,000,000 constitutes a severe tax on the country at a time such as the present, when the value of exports is below cost of production.

The Committee has therefore considered the subject from the point of view of the improvement of the areas at present under cultivation and the possibilities and means of extending the area at present planted.

A progress report of the Committee was published in November, 1930, an abstract of which will be found on page 57 of the present volume of *The Malayan Agricultural Journal*. The present review will therefore avoid, as far as possible, re-iterating the conclusions stated in the interrim report and will be confined to a more general view of the final recommendations of the Committee.

With the object of collecting evidence on the rice-growing problems peculiar to each State, the Committee took the very wise course of forming visiting sub-committees which examined the problems in every part of the Peninsula. The reports of the sub-committees are contained in Appendix 1 of Volume II. The minutes of the twenty-five meetings of the Committee form the second Appendix of this Volume; while Part 3 consists of twelve memoranda dealing with various cognate subjects, such as the history of the Krian Irrigation Scheme and of the Government Rice Mills, padi seed distribution in Krian, rice cultivation by Chinese in Malaya and power cultivation of rice in Southern Siam.

The main report and recommendations of the Committee are contained in Volume I. A summary of the principal findings and recommendations is given and an exceedingly useful Addendum of "Recommendations Regarding Irrigation Works."

Turning to the report itself; preliminary sections deal with general remarks and with the history of padi cultivation in Malaya; conditions under which rice is grown; areas under cultivation and present production; statistical; and the character of padi lands in Malaya.

The Committee is of opinion that in addition to the area already cultivated with rice there is a further potential area of about 600,000 to 1,000,000 acres suited to this crop. It is indicated that such areas should not be diverted from the purpose for which they are best suited—the production of rice. The Land Enactment of 1911 laid down that land suitable for padi cultivation should not be alienated for other purposes except under a special condition requiring that a portion thereof shall be cultivated annually with rice. This Land Enactment was repealed and replaced by a new Enactment in 1926 in which a section corresponding to the above was not included. The Committee recommends that such provision should be re-included by an amending Enactment and that similar provision should be enacted in the other territories of Malaya.

A section of the Report treats of the conditions of tenure of padi lands and the legislation in respect of padi planting. The section states the various forms of legislation which govern the regular planting of the crop. A further section, and this is one of the most important portions of the report if not the most important, considers the question of policy regarding the extension of rice cultivation.

It is evident that there was a sharp divergence of opinion in the Committee on the subject of encouraging and extending rice cultivation in Malaya to alien races, in particular to the Chinese and Indians. Paragraphs 38 and 101 discuss these questions and state conclusions to which three members of the Committee disagreed. The dissentients have stated their opinions in Riders to the Report. A Malay member of the Committee is emphatic that "for many reasons, it is supremely essential that all areas of potential padi land in the Malay States should be made Malay Reservations." The Chinese member, in a memorandum, states the arguments in favour of encouraging Chinese and Indian rice cultivators, while one of the European members thinks that the prosperity and financial security of the Malays will be assured by the infiltration of sturdy rural stock, geographically and ethnographically akin to the local race of Malays.

A large portion of the Report concerns itself with questions of control of water on padi lands. Very rightly, the Committee considers that this is the crux of the question. The present irrigation schemes have been reviewed by the Committee, and the work of the Hydraulic Branch of the P.W.D. examined. The Committee is in favour of the creation of an Irrigation Department and outlines the methods of obtaining liaison between the Irrigation Department, the Department of Agriculture and the Administrative Service. Detailed recommendations regarding the irrigation of existing areas are, as stated previously, included in the Appendix and Addendum of the Report.

Attention is directed to the possibility of irrigating by means of pumps. The findings of the Committee are that the view held until recently that irrigation by pumping is not an economical proposition is probably wrong, in support of which examples of its successful employment in other countries are instanced. Consideration is also given to the possibility of utilising the water stored at the

Perak Hydro-electric Company's dam and it is concluded that any hopes entertained in this respect are unlikely to prove practicable.

The Report discusses and makes recommendations regarding the improvement of existing areas and for the creation of new padi areas. The Report states :

> "Development in two directions obviously lie open : The first comprises the improvement of conditions in existing padi areas together with such immediate extensions to them as may be readily practicable; the second comprises the establishment of new padi areas. We desire to emphasise that, if padi cultivation is to be rendered more stable and production to be materially increased, developments in both directions are essential, but that improvements in existing padi areas are more likely to bring about immediate results than extensions of rice cultivation in new areas. Developments of new areas are likely to be much more easily and quickly achieved if they constitute a definite extension of existing areas rather than the opening up of new territories where padi is not at present grown."

The section enlarges on the application of this finding in relation to particular areas. It will be necessary for the Administrative, Agricultural and Irrigation officers of each State to examine the Report particularly where it refers to their particular areas.

> Regarding mechancial rice cultivation, the Report states : "It is clear that, working in this way, rice can be produced very much more cheaply than under existing conditions of cultivation and the possibility of establishing rice estates is one that should be kept prominently in view."

It is further stated that the consideration of Government should be given to encouraging projects of this description having due regard to the opinion stated on the subject of settlement of population on new areas.

The agricultural services should be extended on the lines already laid down, which have for their object the improvement of varieties of padi, organisation for the distribution of improved seed after being tested at local centres, investigation concerning machinery, research work and its application on pests of padi, and financial assistance of agricultural service to States which are at present unable to finance such service from their own resources.

The continuation of rat campaigns in large areas is advocated. The extension of campaigns of this description should be given consideration in Kedah, Perlis and Kelantan.

It is recommended that in areas where fully adequate water control is possible the growing of two crops of padi per annum should be encouraged and coupled with the use of manures. The reviewer's experience has been that duration of crop has a strict relation to yield in spite of manuring. This no doubt is due almost entirely to the extent of tillering. Neither does closer planting obviate this objection. It is possible that, contrary to the opinion of the Committee, the cultivation of these short duration varieties is only justified in areas where the water supply is inadequate for a long padi-growing season.

The Committee does not recommend the cultivation of dry padi, except in areas in which the water supply is so erratic as to render "wet" padi cultivation impracticable, but recommends that in such areas if extensive, the selection of heavy-yielding strains, manurial methods and crop rotations aiming at the maintenance of soil fertility should be given attention.

The financial position of padi cultivators is discussed. In this connection, the Committee recommends the extension of co-operative principles and greater liaison between co-operative and administrative officers.

The importance of buffaloes in rice cultivation is emphasised, and in this connection it is recommended that when circumstances permit, a Government buffalo stud farm be inaugurated with the object of improving the local breed of buffaloes. Further, it is recommended that research work in the prevention of rinderpest be subsidised and it is suggested that the balance of the Pahang Flood Relief Fund might be devoted to this object and to the improvement of the supply of buffaloes.

The Report contains recommendations concerning the cultivation of foodstuffs on estates. It states that Boards of Directors should be requested to instruct their managers to lay down definite plans in this connection and to see that they are continuously followed. Estates with areas suitable for rice cultivation should develop them as such or surrender such lands to Government for re-alienation for padi cultivation. Where portions of an estate are cultivated with padi, such areas should be subject only to the quit-rent which is normally demanded of such land.

The Chinese member of the Committee disagrees with the proposals regarding padi cultivation on estates. He points out that the areas are generally much too scattered and that it would be difficult to induce estate labourers to plant rice on proper lines on land not belonging to them.

Further, the Chinese member points out that the sub-committee did not ask planters to give evidence and therefore, does not know their views on this question.

The question of mining and rice cultivation is given consideration. Investigations regarding reclaiming old mining land, on the best condition in which mined land should be left with a view to future padi cultivation, and the economics of removal of top soil before mining an area and its replacement after completion of mining are among the recommendations made in this connection.

Finally, consideration is given to possible methods of financing the recommendations contained in the Report, and the conclusion is reached that this might most fairly be achieved by a loan or series of loans, and in this connection the suggestion is made that enquiry might be made as to whether any measure of assistance would be forthcoming from the Colonial Development Fund.

The Report concludes :—

> "We feel, that the situation is such at the present time as to render it imperative that steps should be taken on more vigorous lines than have hitherto been contemplated for the extension of the rice industry. We feel

that any increases in production that may result would be an additional insurance against the threat of shortage owing to failure of outside supplies and an alleviation of wants owing to the depreciation of markets for export staples. We think that, in these circumstances, any additional expenditure that may be required may properly be faced by the Government."

This is a most comprehensive report of which a review can give but a bare outline. No doubt it will be most carefully examined by the Governments of Malaya, but it is deserving also of the close study of the general public who cannot at this juncture be unaware of the importance of the subject and should feel that the responsibility is theirs as well as that of the Governments.

The fear has been expressed to one member of the Committee "that every one will give lip service to the report and make a few gestures and then let it slide." It is to be hoped, however, that this fear may not be realised, but that the Government and public opinion may jointly work towards the adoption of these recommendations.

D. H. G.

Tyre Consumption and Rubber Production.

The Rubber Division of the Department of Commerce, United States of America has recently published estimates of the annual consumption of tyres per car in the United States, basing the statistics on the number of cars in service and the production of tyres.

Since the United States possess the largest number of cars in service the results should be of general interest. According to these estimates, the annual replacement during the years 1910-1917 has been 6.5 to 7 tyres per car. After 1918 a marked decrease in this replacement figure has taken place, reaching a figure of about 2 tyres per car in 1929.

The following table gives the figures for each year from 1910 to 1920.

Year.	Tyres per car.	Year.	Tyres per car.
1910	7.84	1921	3.16
1911	6.64	1922	3.36
1912	6.48	1923	2.93
1913	6.50	1924	2.99
1914	6.65	1925	2.80
1915	6.59	1926	2.38
1916	6.63	1927	2.48
1917	7.26	1928	2.50
1918	5.88	1929	2.11
1919	5.01	1930	1.65
1920	3.65		(provisional figures).

The reviewer and others who are acquainted with the notable advances made in tyre manufacture in relation especially to improved quality, have emphasized on various occasions the important bearing of these figures and facts in relation to consumption of raw rubber. It is only necessary to bear in mind the fact that about 70 to 75 per cent. of raw rubber is consumed in tyre and tube manufacture in order to realise the effect of this decrease in tyre consumption on the consumption of raw rubber.

Fortunately the large increase in output of cars during the period under review has helped to neutralize the position to some extent. These figures are also correlated with facts known to every car owner who has possessed a car during most of the period covered by the figures. Whereas formerly 5,000 miles per tyre was considered a good performance—at the present time no car owner is satisfied with less than 10,000 miles per tyre, while performances of 15,000 to 20,000 miles per tyre are common. Although it may be considered by some that these results are due to the improvement in roads, the higher speed at which cars are now generally operated balances to a considerable extent the effects of road improvements, since it is well known that higher speeds result in greater wear and tear due to friction. Higher speeds would not have such an effect on the "ideal" road surface which would be free from all irregularities, but fortunately for tyre consumption, even with modern improvements, our road surfaces are not yet "ideal."

It can be stated fairly emphatically that the results are due to modern improvements in the quality of tyres effected by physical and chemical research.

B. J. E.

Journal of the Rubber Research Institute of Malaya.

The Journal of the Rubber Research Institute of Malaya, Vol. II No. 4, April 1931, price 50 cents, contains the following articles :—

The Effect of certain Fungicides on the Vitality of Hevea Buds by R. P. N. Napper; Test Spraying Experiments on Young Rubber Plants by F. Beeley; The Output of Estate Sheeting Batteries by E. Rhodes and R. O. Bishop; and Manganese in Raw Rubber by R. O. Bishop and K. C. Sekar.

Miscellaneous Articles.

ENTOMOLOGICAL NOTES.

Second Quarter, 1931.

BY

G. H. Corbett.

Copra.

In "Entomological Notes, First Quarter, 1931," attention was directed to the fact that a considerable reduction in damage caused by insects to copra before leaving estates could be effected if old rice sacks were rendered insect-free prior to filling them with copra. During the past quarter the writer, in company with Mr. F. C. Cooke (Assistant Chemist for Copra Research), visited several coconut estates to ascertain if copra was heavily infested with insects before leaving estates and, if so, if suggestions could be advanced whereby insects could be reduced .

The principal insects were :

1. *Carpophilus* sp., probably, *dimidiatus* (Nitidulid).
2. *Necrobia rufipes* F., the Copra beetle or "bug" (Clerid).
3. *Silvanus surinamensis* L., the Saw-toothed flour beetle (Cucujid).
4. *Silvanus advena* Waltl., (Cucujid).
5. *Tribolium castaneum* Hbst., the Red flour beetle (Tenebrionid) and
6. *Ephestia cautella* Walk., Flour moth (Pyralid).

Other insects were also found but were not so numerous.

The beetle, *Carpophilus* prob. *dimidiatus*, is about 3 mm. in length, brownish and with short wing covers. It was found on all estates but a considerable variation in the numbers was observed. The variation in the numbers of this beetle was in proportion to the amount of improperly dried copra. Where copra had been properly cured, this insect was practically absent. Observations have not been sufficiently extensive to make definite statements, but little doubt remains that if copra drying on some estates were accelerated, thereby preventing the development of moulds to which this insect would appear to be especially attracted, this beetle would not be so abundant in copra leaving estates as it is at present. It is interesting to record that on one estate this beetle was present on copra, which had developed moulds, on the edge of the drying kiln. Apparently this fact had been overlooked. The improperly dried copra was sorted and placed on a kiln in the sun for further drying. This beetle was present amongst this partially dried copra in enormous numbers. If this beetle should be present on estates, attention should be directed to ascertain, firstly, if drying requires to be accelerated and secondly, if copra is sufficiently dried before being removed from the kiln.

In a list of the insects found on copra on its arrival in England, this beetle is not recorded.

Necrobia rufipes F. is the well-known beetle which is frequently encountered on ships and referred to generally as the copra "bug". The adult is about 5—8 mm. in length, bluish in colour with reddish coloured legs and antennae. This insect is generally considered to be predaceous but it has been successfully bred from egg to adult on insect-free copra.

This beetle was absent in some copra stores but present in others. The presence of this beetle was apparently entirely due to the fact that the empty sacks, which contained previous consignments of copra, were returned from ports. In no instance, where copra was shipped direct, (i.e. where no sacks were returned to the estate) was this insect observed. In one case, sacks which had just arrived from Singapore were found with this copra 'bug'. In this connection, it is interesting to record, as confirming the above statement, that the Manager of one estate remarked that sometime ago when his sacks were returned, he encountered considerable trouble from this beetle and was obliged to fumigate his store. Subsequently he shipped his copra direct to England with the result that *Necrobia* is now never seen in his store. It would therefore appear in order that copra should arrive *Necrobia* free at the country of importation, efforts should be made to control this beetle at ports or failing that, for copra to be exported direct. It is realised that this subject is a delicate one but it is doubtful if any change is procedure will occur until a better price obtains for insect-free copra.

Silvanus surinamensis L., *S. advena* Waltl., *Ephestia cautella* Walk. and *Tribolium castaneum* Hbst.

Silvanus surinamensis.—Saw-toothed flour beetle, is dark brown, elongated, about 3 mm. in length with teeth on lateral margins of first thoracic segment.

Silvanus advena, another Cucujid beetle, is about 2 mm. in length, brown with a tooth on anterior lateral margin of first thoracic segment.

Ephestia cautella—is a small moth, the caterpillar of which feeds on and spoils by webbing the appearance of copra.

Tribolium castaneum—is a reddish brown beetle, about 3.5 mm. in length, with clubbed antennae.

The above four insects are commonly associated with stored rice and since they, with other stored rice pests, feed on copra, the use of old rice sacks for the purpose of transporting copra is conducive to it becoming insect-ridden by the time it arrives at its destination. No precautions would appear to be taken to render these sacks insect-free with the result that the copra is immediately attacked. Indeed, unless a better price is obtainable for insect-free copra, the writer is unable to advance any particular reason (unless by so improving its appearance, the buyer will eventually realise that Malayan copra is comparatively free from insects and will pay a higher price) why extra expense should be incurred by so making it. Nevertheless, old rice sacks could be rendered free from insects without involving considerable expenditure by immersing the sacks in boiling water or in a solution of tuba root. In this

connection, it may be mentioned that the rice store is frequently within the copra store. This arrangement should not be countenanced, since copra in store is exposed to insects emerging from the rice in the rice store.

It is interesting to note that on some of these estates, the well-known rice weevil, *Diocalandra oryzae* L., was present, but no specimens of this weevil were collected from the copra.

In summing up these brief remarks, the return of sacks from ports would appear to be responsible for the presence of *Necrobia rufipes* on estates, the use of old rice sacks for the presence of the rice pests in copra, and improperly cured copra for damage by *Carpophilus* (?) *dimidiatus*. With ordinary precautions, and especially if copra were shipped direct, copra should not be so insect-ridden, as it is at present, on arriving at its destination.

Shade Trees.

Some crops for their successful cultivation require shade which is provided by growing trees throwing shade of a varying intensity. It will be seen therefore that the establishment of a cover tree is as important as that of the crop and in considering the species of shade trees, those which are nearly related to the crop should be avoided, since pests of the one will probably be pests of the other. Equally important also is to ascertain if shade trees are liable to be severely defoliated by any particular pest, since subsequently, expense may be incurred by having to replace one shade-throwing tree for another.

One of the accompanying photographs illustrates the injury caused by an insect to *Albizzia* used as a shade tree. The particular insect responsible for the almost entire defoliation of *Albizzia* trees over some 30 acres was the "case-worm", *Clania variegata* Sn. "Case-worms" are the caterpillars of Psychid moths and some species are important pests to crops. The interesting feature of psychids is the absence of wings in the female; the male is winged. The spread of these insects is therefore not dependent on the female moth, but on the caterpillars. This distribution may be accomplished by the caterpillars suspending themselves by silken threads from the tree and being conveyed by the wind from one tree to another or by the caterpillars reaching the ground by their silken threads and crawling to a neighbouring tree. An examination of the area of *Albizzia* trees under consideration revealed the futility of recommending a poisonous spray owing to the fact that the trees had been so completely defoliated: instead, the employment of sticking bands, composed of castor oil and rosin, around the bases of the trees to prevent the caterpillars from re-ascending the trees was suggested with the result that the ascent of the caterpillars was stopped, as is shown in the other photograph.

Derris. (Tuba.)

Stored Derris roots have from time to time been reported as bored by beetles. During this quarter, two complaints have been received concerning the loss occasioned to 'tuba' in store by beetles. Not only is 'tuba' seriously affected

General View of Albizzia trees defoliated by "Case-worms".

CASE-WORMS PREVENTED FROM RE-ASCENDING ALBIZZIA TREES BY A STICKY BAND.

in Malaya, but consignments of Derris root exported from Malaya have been found to be heavily damaged by insects on arrival at their destination. The principal beetles feeding on 'tuba' root are *Sinoxylon anale* Lesne., *Sinoxylon malaccanum* Lesne., *Xylopsocus capucinus* F., *Dinoderus bifoveolatus* Woll., *Minthea rugicollis* F., *Hypothenemus eruditus* Westw. and *Bothrideres (?) andrewsi* Grouv. The first five beetles are Bostrychids, the sixth a Scolytid and the last a Colydiid.

Apart from the interesting fact that these beetles thrive on derris root, which is the source of the insecticide 'tuba' and enters into the composition of several derris insecticidal preparations, the questions of financial loss to the growers and of the heavily infested root on its arrival at its destination should be considered. Where derris is grown on a commercial scale and is stored for an indefinite time, fumigation and storage in air-tight receptacles should be undertaken. The aim should be to obtain an insect-free product on its arrival at the importing country, otherwise 'tuba' from Malaya may not command the best market price.

Coffee.

The discolouration of coffee seeds in otherwise healthy looking berries was reported from one estate. In the majority of cases one only of the two seeds showed this black discolouration, the other having developed normally. This discolouration of the seed was traced from the ripe to the just forming berry which indicated that the damage was inflicted to the young seeds when the coffee bush was in flower. The examination of coffee flowers revealed the presence of a thrips ((?) *Heliothrips haemorrhoidalis* Bouché.) which probably introduces a pathogenic organism, causing thereby the discolouration of the coffee seeds. Specimens of berries were submitted to Mr. A. Altson, Acting Mycologist. He failed to isolate any fungi or bacteria and suggested that the degeneration of the seed may be caused direct by insect punctures or by an insect introducing a pathogenic organism.

Tea.

No serious caterpillar pest of tea in lowland areas is known in Malaya. Tea at high altitudes would appear to be more subject to damage by caterpillars. The tea leaf-roller (*Gracilaria theivora* Wlsm.) was reported from Cameron Highlands causing serious damage to the younger leaves. The caterpillar of this moth at first mines the young leaf from the mid-rib to the edge. Subsequently, leaving the mine, it folds the leaf and feeds under cover of the rolled-up leaf. The control of this moth consists in cropping attacked leaves and all shoots ready for plucking, and burying or burning prunings.

The moth is about 6 mm. in length, the forewings are purplish brown with an orange coloured semicircular marking in the middle of the anterior margin

of the forewing. The caterpillar attains a length of about 10 mm. and is greenish white with a brownish coloured head.

Tea bushes in a certain area in the lowlands suffered from a "white ant", probably a species of *Microtermes*. Experiments have been laid down in order to find an effective control.

General.

"Bordeaux" mixture would appear to be regarded in some quarters as an insecticide and disappointment that it has failed to kill caterpillars has been experienced. Whilst Bordeaux mixture is an excellent fungicide, it is not an efficient insecticide. Lead arsenate at the rate of 2 lbs. to 50 gallons of water will effectively control most leaf-eating insects.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE HELD ON JUNE 5th 1931.

A meeting of the Agricultural Advisory Committee was held on 5th June, 1931 at which the following members were present :—

The Director of Agriculture, Dr. H. A. Tempany (Chairman). The Director of Co-operation, Mr. A. Cavendish. The Director, Rubber Research Institute, Major B. J. Eaton.

Messrs : M. J. Kennaway, J. Melville, R. E. M. Michaux, G. S. Reis, W. A. Stanton and The Assistant to Director of Agriculture, Mr. W. N. C. Belgrave (Secretary).

The meeting was preceded by a visit of members of the Committee to Serdang Experimental Plantation on June 4th, when the School of Agriculture, the Stock Farm, planting nurseries and factories were inspected : in the evening of the same day the members attended a private view of the film recently prepared by the Department on the subject of Rice Cultivation.

At the meeting various subjects were discussed; these included :—

1. *Reorganisation Proposals for the Department.* The Governments of the Straits Settlements and Federated Malay States, had accepted the Director's scheme for reorganisation of the European and Asiatic staff of the Department, with some modifications and with the proviso that for the Federated Malay States the scheme for Asiatic Assistants should be confined to Malays, officers of other Asiatic nationalities being appointed *ad hoc* as necessity arose.

In relation to Chinese agriculture a small staff of Chinese Sub-Inspectors of Agriculture was also envisaged ; excellent relations had already been established with the large population of Chinese market gardeners in Selangor through the intermediary of the Chinese agricultural officer appointed three years ago.

It was anticipated that the construction of the new buildings and laboratories for the Agricultural Department would shortly commence.

The programme for the considerable extension of agricultural stations and test plots had been accepted by the Administrations concerned and satisfactory progress had been made with their establishment.

An officer of the Field Division had been seconded to Kelantan with a view to the improvement of agricultural conditions in that State.

2. *Work on Padi.* The standard manurial experiments for the season 1930—31 had, as a whole, not demonstrated satisfactory increases as a result of application of a variety of artificial fertilisers, although at Talang Experimental Station large increases were obtained on previously neglected land. Further experiments will be carried out in the season 1931—32.

Tested pedigree seed produced at the stations of the Agricultural Department would be on sale in the forthcoming season in every mukim of Krian, and it was hoped to extend this system throughout the country in subsequent seasons.

The present system of estimation of padi yields by guess work was unsatisfactory and various methods of estimation had been under test during the past season.

The results of last season's work on control of padi stem borer by liberation of egg-parasites on a large scale had been inconclusive; parasitisation and plant infestation had been found to decrease as a result of liberation of parasites but no clear evidence of increased yield had been obtained.

It is hoped to continue the experiments in the coming season.

3. *Work on Coconuts.* Unexpected difficulties had been encountered which had prevented the anticipated extension of the Coconut Experiment Station, Klang. It was hoped that these would be overcome before the end of the year.

The Assistant Chemist, Copra Research, had been deputed to pay a visit of one month to Ceylon to study methods of copra production there with a view to a better understanding of the premium gained by Ceylon over Malayan copra in European markets. A systematic investigation was to be made of the distribution of coconut roots in relation to drainage problems and loss of trees due to excessive leaning.

4. *Agricultural Work at Fraser's Hill.* The buildings for the dairy at Jeriau had been completed and progress made with the vegetable and poultry areas. It was intended to establish a depot at the Simpang for the sale of dairy products, vegetables and possibly flowers. A herd of high-grade cattle was on the way from South Africa.

5. *Rat Campaign.* The system of paying rewards for rat tails had been abandoned in Perak and Province Wellesley, as it was considered to have served its purpose of demonstrating the benefits of rat destruction. Guidance and assistance would continue to be given to cultivators in their war against rats.

6. *Progress at Cameron Highlands.* Tea-making machinery would shortly be installed and in the meantime the experimental manufacture of hand-made tea would be discontinued.

7. *Statistical Work.* The Deputy Registrar-General of Statistics has been seconded for a further period of one year as Statistician to the Department of Agriculture.

8. *Small Holdings.* A grant of $10,000/- from the Rubber Research and Experimental Fund had been approved for the carrying out of measurements of bark reserves and bark consumption on small holdings.

9. *Tobacco Growing.* With the co-operation of one of the large tobacco-growing corporations, experiments had been commenced with cigarette tobacco at the Government Experimental Stations.

Other subjects discussed were the projected Fertilisers Enactment, soil erosion, the annual report of the Department and the local tea industry.

In view of the Director's early departure on leave a resolution was passed expressing appreciation of the improvement and progress that had been made in every phase of agricultural work in this country since Dr. Tempany's arrival.

In reply, the Director attributed much of the progress accomplished to the unfailing and willing assistance of members of the Advisory Committee and of the planting community, both European and Asiatic, to the sympathetic attitude of the Governments, and to the co-operation of the staff of the Department.

Departmental.

FROM THE DISTRICTS.

The Weather.

Rainy weather with sufficient water for seasonal operations in connection with the padi crop is reported from everywhere. In a few instances the rainfall was in excess of requirements; thus, flooding of a newly transplanted area at Mantin, flooding of nurseries in Malacca (without permanent injury being done) and the holding up of work in Penang owing to several severe floods and too deep water is reported. In nearly every case rainfall figures given indicate a precipitation for the month well above the average. This does not apply to West Pahang where figures approximate to normal but judging from the figures from Pekan, the rainfall on the East Coast was well above the average.

Remarks on Crops.

Rubber.—Local prices ruling for the month differ little from those given for May, being from $8—$14 per pikul for smoked sheet, from $7—$11 for unsmoked sheet, from $2—$7 for scrap and from $5—$7 for lump. The somewhat large range of price for each article is due partly to variation in quality and partly to the situation of the locality as it affects internal transport costs. The general position as regards areas of small holdings out of tapping has not materially altered during the month. It is estimated that one third of the area under tappable trees in Bentong District (West Pahang) is out of tapping as the result of the low price of the commodity and activity in connection with padi planting in Malacca has resulted in a number of Malay holdings remaining out of tapping.

The wet weather experienced has resulted in general increased activity of the Mouldy Rot fungus but control has been fairly efficiently maintained in most localities.

Padi.—General activity in connection with this crop is reported from everywhere.

Fairly heavy infection of stem borer has been found as the result of the inspection of recently transplanted padi in Selangor whereas in Negri Sembilan the examination of eighty nurseries resulted in no trace of stem borer being found.

During the month 665 gantangs of pedigree padi were sold to cultivators in Perak, 464 in Malacca, 46 in Province Wellesley and 520 in Dindings. In addition 658 gantangs were supplied in Malacca to cultivators in Jasin district as a semi-experimental, semi-relief measure. The above does not include distribution in Krian district where orders for nearly 2,000 gantangs have been received and the distribution of this amount is in hand.

Coffee.—The local price hardened slightly during the month being approximately as follows :—

Perak Central	...	13—15	cents a kati	
„ South	...	14—18	„ „	
Selangor	...	12—14	„ „	Klang and Ulu Langat
..	...	10—11	„ „	Kuala Selangor and Kuala Langat
Negri Sembilan	...	10—17	„ „	
Pahang	...	11—12	dollars per pikul	—Temerloh.
„	...	16—20	„ „	Bentong.
„	...	13	„ „	Raub.
Kedah	...	23—28	„ „	(first quality.)
„	...	16—18	„ „	(second quality.)

The above table illustrates the great variation in price in different localities that was referred to last month.

Reports of the presence of the Coffee Berry Borer, *Cryphallus Hampei* have been received from various localities. Thus at Slim in Perak South the pest was found to be doing considerable damage; fresh areas at Port Dickson have been found to be infected and the pest is still paramount in Raub and Bentong districts of Pahang. Further survey of the position in Malacca revealed that although the pest is present in several localities the percentage of infection is low. The pest is also reported from Kulim in Kedah. An area that received treatment in Kuala Pilah (Negri Sembilan) by keeping all berries off the trees for six months was recently inspected. No trace of the pest could be found.

Tobacco.—The area under this crop is still extending in Province Wellesley and interest in the crop is maintained in the Degong area of Perak. In Province Wellesley a large amount of seed of a Rangoon type has been sown, the seed having been supplied by a local manufacturer. In Degong complaints have been received that cheroots made from local tobacco are inferior to those made from imported tobacco. This matter is receiving investigation. The experiments in Province Wellesley with insecticides against leaf eating caterpillars are being continued and some success is reported.

Field Crops.—The increased activity recently evinced in food crops continues to be maintained.

Notes on Agricultural and Padi Test Plots.

Perak.—At the Kuala Kangsar Station attention has been given to experiments with a number of varieties of tobacco and the curing of leaves of some of the earliest planted beds is in progress. Various minor crops are being grown, but the planting up of permanent crops awaits the coming season. Preliminary work on Selama station is well in hand. Details are complete regarding the varietal trials to be undertaken at Padi Test Plots in the coming season. It is anticipated and these trials will be made at the following centres, Lenggong,

Upper Perak; Bukit Gantang, Larut; Talang, Kuala Kangsar and Bruas, sub-district of Bruas. Manurial and cultivation experiments have been laid down at Talang and the cultivation trials at Selinsing are to be continued.

Selangor.—Transplanting is nearing completion on the Test Plot at Kuang. The use of the Kajang plot as a Padi Test Station has been discontinued and the area is to be used for training in connection with the School of Agriculture. Thirteen students spent three days at the plot transplanting seedlings.

Negri Sembilan.—Draining has received improvement on the Seremban Fruit nursery and manuring of the established fruit trees received attention. Felling and burning has been completed on the Rembau Agricultural Station site. The Rembau Padi Test Plot has been cultivated and a nursery area fenced off in preparation for sowing.

Pahang.—Agricultural Stations. Tobacco trials are being laid down. The maize and soya bean are doing well. Felling was completed in the Temerloh station site. Fencing of the Kuantan station is completed and draining work is in hand. At the Pekan station plots of maize, Guinea grass and yams were planted. A scheme is being drawn up to bring this station in line with the general plan of work governing other agricultural stations.

Padi Test Plots. Nurseries have been sown at the Raub Plot and planting has commenced at Temerloh and Pekan.

Malacca.—Clearing, except for the larger stumps, is complete at the Sungei Ledang Station and a skeleton staff only is employed until the planting season commences. Ploughing and harrowing has been done on the maintenance of Pulau Gadong Padi Station and nurseries have been sown. Nurseries have been sown at the Alor Gajah Padi Test Plot.

Province Wellesley.—Improvements to bunds have been completed at Glugor Test Plot. The inter-crop short season varieties of padi have suffered from flooding and rat damage. As the planted area is completely surrounded by a heavy growth of vegetation, on the land being fallowed between crops efficient control of rats on the planted area is a very difficult matter. Radin Siak appears at present to be the most promising of the inter-crop varieties tried. The new irrigation drain and dam at Bukit Merah Test Plot was completed by the middle of the month and is working satisfactorily.

Kedah.—Good rains enabled ploughing to be started under favourable conditions on the Telok Chengai Padi Station. The beneficial effect on the physical properties of the soil through allowing the straw to rot on the land instead of burning it is very marked and it enables deeper and quicker ploughing to be done. A series of manurial and cultivation trials have been laid down and plots have been marked off for these.

Rat Destruction.

The re-organisation of the control scheme in Krian and Province Wellesley has now been finished and work on the new basis has commenced.

DEPARTMENTAL NOTES.

The Director of Agriculture on Leave.

Dr. H. A. Tempany, Director of Agriculture has been granted 7 months and eighteen days' leave on full pay with effect from the 13th June, 1931.

Dr. Tempany will represent the Governments of the Federated Malay States and Straits Settlements at the first Conference of Directors of Agriculture to be held in London from the 14th to the 17th July, 1931.

The Federated Malay States Government has approved a proposal that Dr. Tempany should, during the period of his leave, visit the rice fields of Northern Italy and also certain Agricultural Institutions in England, with a view to studying rice planting on modern lines, and to keep in touch with recent developments in agriculture.

Mr. F. W. South, Chief Agricultural Field Officer assumed the duties of Acting Director of Agriculture from the date of Dr. Tempany's departure on leave.

Copra Research.

Mr. F. C. Cooke, Assistant Chemist for Copra Research sailed from Malaya on 16th June for Ceylon, where for a period of one month he will make a special study of the conditions in relation to copra manufacture in that Colony.

In view of the fact that Ceylon copra is considered superior to that prepared in Malaya and to the growing importance of the industry in the latter country, a close comparison of the methods of manufacture in the two countries has been found essential for the development of Mr. Cooke's investigations.

Vernacular Publications.

Warta Perusahaan Tanah—the quarterly Malay agricultural journal of the Department—Volume IX, No. 1 was published on April 24th.

It contains articles on budding of rubber; the School of Agriculture, Malaya; the preparation of rubber from the point of view of small-holders; tobacco cultivation; co-operative rubber societies; the clove and nutmeg industry; the coffee berry beetle borer and school gardening.

The growing demand for this publication has necessitated the printing this year of 5,500 copies per issue, an increase of 500 copies per issue over last year.

Four Malay leaflets have been published this year, with a total of over 75,000 copies. The subjects of these leaflets are Rat Destruction, Mouldy Rot disease of Rubber, Stem Borers of Padi and Tobacco Cultivation. In addition, a reprint of 5,000 copies of the leaflet on Soil Erosion has been published. A very steady demand from Malays for the leaflets has been maintained, in addition to which they have proved most useful in connection with the tours of the Rural Lecture Caravan.

The Chinese Agricultural Journal, Volume V No. 1 was published in March, the issue consisting of 5,000 copies. It contained articles on Pink Disease of

Rubber, How to improve Malayan Kampong Copra, Pineapple Bran, The Coffee Berry Borer, Tobacco Cultivation in Kedah, Mechanised Rice Cultivation in Southern Siam, The School of Agriculture and the Development of Imported Live Stock in the Tropics.

Tours of the Rural Lecture Caravan.

The Caravan made a tour in Malacca from 25th May to 6th June, 1931. The tour was supervised by the Agricultural Field Officer, Malacca and was under the immediate charge of Malay Officers of the Departments of Agriculture and Co-operation. Twelve centres were visited, at each of which the agricultural officer gave a lecture on padi cultivation which was assisted by a number of exhibits in the afternoon, while in the evening he gave a lecture on Mouldy Rot disease of rubber, illustrated by lantern slides.

The attendances at the afternoon sessions seldom exceeded 100, a poor figure when compared with the evening when an average of over 1,000 people gathered for the purpose mainly of viewing the Co-operative film. The lecturer was of opinion, however, that the afternoon sessions were more successful as the audience consisted of the more influential people; who could all see the exhibits, hear the lecturer and had a freer opportunity of asking questions.

The total attendances in Malacca exceeded 15,000 persons.

The Lecture Caravan commenced a tour in Province Wellesley and Penang on 20th June which will continue till July 2nd, 1931. The equipment on this tour will include for the first time a film, prepared by the Department of Agriculture entitled "Rezeki" which deals with the necessity of increasing the local cultivation of padi and the means whereby larger yields of better quality padi may be obtained.

Stock for Dairy Farm Fraser's Hill.

Twenty six heifers and one young bull of the Friesian breed have been imported by the Department from South Africa. They arrived in Singapore on 27th June and were transported by railway and lorry to the Government Stock Farm, Jeriau, Fraser's Hill where they arrived in good condition the next day.

One calf was calved during the voyage and one calved within twelve hours of arrival at Fraser's Hill. The calves are in good condition which is evidence of the good health of the stock maintained throughout the voyage of about one month.

The Selangor Gardening Society Visits Serdang.

The Selangor Gardening Society visited the Government Experimental Plantation, Serdang on 29th June, 12 members being present, including Sir Lancelot Elphinstone, Chief Justice F. M. S., who is President of the Society.

The opportunity was taken on this occasion to show the visitors the work being conducted with the cultivation of food crops.

Leave.

Mr. J. Gordon-Carrie, Statistician and Deputy Registrar-General of Statistics has been granted 8 months and 25 days' leave on full pay with effect from the 27th June, 1931.

Mr. J. A. Craig, Principal Agricultural Officer, Kelantan, has been granted 7 months and 10 days' leave on full pay with effect from the 28th June, 1931.

Staff Changes.

Mr. D. H. Grist, Agricultural Economist, to act as Statistician and Deputy Registrar-General of Statistics in addition to his own duties from 27th June, 1931.

Mr. F. Birkinshaw, Agricultural Field Officer, Perak North to act as Chief Field Officer from 12th June, 1931.

Mr. A. E. Coleman Doscas, Agricultural Field Officer, Selangor to act as Agricultural Field Officer Perak North from 12th June, 1931.

Raja Mohamed bin Raja Aman to act as Agricultural Field Officer, Selangor from 12th June, 1931.

Statistical.

MARKET PRICES.

June, 1931.

The American moratorium proposals have affected local Produce Markets and prices for most articles show some advance.

Rubber.—Until the last three days of the month, when the local price of rubber appreciated by about half a cent per lb., the rubber market has been quiet, the spot price of RSS equal to London Standard being about 9½ cents per lb. The average Singapore price for the month was 9.5 cents per lb. compared with 9.1 cents in May. The average London price was 3d per lb. as in May.

Palm Oil.—The May London prices for palm oil were very disappointing. A London correspondent, writing on 14th May stated that the value was £15.10.0 to £16 C.I.F. (£10.10.0 to £11 F.O.B.) according to F.F.A. content at origin and by May 21st the price had further declined by about 10 shillings per ton.

Copra.—Prices were at their lowest ebb at the beginning of the month with the price around $3.80 per picul but a sharp reaction took place, due in part to the demand of the local Oil Mills, which culminated at the end of the month at $5 per picul. The average price on the Singapore market for "Sundried" was $4.23 per picul, compared with $4.80 in May. For the "Mixed" quality, the average price was $3.99 compared with $4.59 in May. Copra cake was steady at $1.75 per picul.

Gambier.—The price of No. 1 Cube gambier has remained steady at $15 per picul. Block gambier declined from $11 to $8.75 per picul, the average for the month being $9.68 compared with $11.21 in May.

Rice.—All grades of imported rice experienced a fall in prices during the month, reaching the lowest point about 17th May and thereafter recovering somewhat. Average Singapore prices per coyan for June were: Siam No. 1 $138, Saigon No. 1 $131, Rangoon No. 1 $119, compared with $157, $135 and $126 for the previous month.

Arecanuts.—Prices for most grades improved slightly during the latter part of the month. Average prices per picul for the various grades were: Palembang Whole $3.82; Bila, Whole, $3.50, compared with $4.81 and $3.94 respectively in May. For other grades, the average prices ranged as follows:- Sliced $6.12 to $13; Red Whole, $5.37 to $6.40; Split $3.57 to $4.90; Kelantan Split $5.40 to $5.81, the price within each range depending on quality.

Coffee.—Prices have been fairly well maintained and are said to be firm in Java. The price per picul of Java Robusta averaged $16.87 to $18.94 the price within the range depending on quality. Palembang coffee averaged $12.87 per picul.

Pineapples.—Supplies of fresh fruit continue to be short and higher prices have been paid. The average prices per case for June were:- 1½ lb. cubes $3.50,

1½ lb. sliced flat $3.36, 1½ lb. sliced tall $3.57, compared with the following corresponding prices for May $3.20, $3.09, $3.37.

Tapioca.—The market has been quiet. Average prices per picul were :- Flake fair $3.19; Pearl, seed $4.19; Pearl, medium $4.90 compared with $3.32, $4.50 and $5 respectively in May.

Sago.—Market was poor for the greater part of the month, but a moderate advance took place during the last week. Average prices per picul were for Pearl, small fair $4.45; Flour, Sarawak fair $1.78 compared with $4.50 and $1.93 respectively in May.

Pepper.—Prices improved at the end of June, but it is thought that the demand is largely speculative. Singapore black averaged $18.12 per picul compared with $18.44 in May; Singapore, white $29.75 against $32.20 in May; Muntok, white $30.75 compared with $33.68 for the previous month.

Cloves.—Zanzibar cloves have remained steady at $52 and Amboina at $56 per picul. Average prices for May were $54.40 and $56 respectively.

Mace.—Average Singapore prices per picul in June were: Siouw $51.75; Amboina $38.12. Corresponding prices in May were $56 and $43.

Nutmegs.—Supplies are short and an improved demand from Germany resulted in an all round advance in prices at the end of the month. Average prices per picul for June were for 110's $20; 80's $26, compared with $19.50 and $25.70 per picul in May.

The above prices are based on London and Singapore quotations for rubber; on the Singapore Chamber of Commerce Reports published in April and on other local sources of information. Palm Oil Reports are kindly supplied by Messrs. Lewis and Peat (Singapore) Ltd., and reports on the Singapore prices for Coffee and Arecanuts by the Lianqui Trading Company of Singapore.

1 picul = 133⅓ lbs. ... ... 1 Coyan = 40 piculs.

The dollar is fixed at two shillings and four pence.

NOTE. The Department of Agriculture will be pleased to assist planters in finding a market for agricultural products. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

MALAYA RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MAY 1931, IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres (estimated) 2		Imports				Exports (including re-exports)				Stocks at end of month		
								during the month		during the year 1931		during the month		during the year 1931				
	Ports	Dealers	Estates of 100 acres and over	During the month	during the year 1931	during the month	during the year 1931	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Dealers	Estates of 100 acres and over	Ports
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States	...	12,864	12,583	11,142	56,167	7,982	43,282	Nil	Nil	Nil	26	12,481	6,521	66,371	35,191	12,296	13,273	...
Johore	...	2,228	4,372	3,460	17,474	3,569	19,698	Nil	2	Nil	9	817	6,504	3,634	34,083	2,315	3,995	...
Kedah	...	432	2,051	2,065	9,996	1,023	5,249	Nil	Nil	Nil	Nil	608	2,399	3,110	12,620	416	2,148	...
Perlis	...	10	9	11	39	2	53	Nil	Nil	Nil	Nil	Nil	18	Nil	99	9	5	...
Kelantan ...	...	108	102	204	982	356	1,994	3	Nil	12	Nil	46	470	347	2,595	179	78	...
Trengganu ...	..	55	50	94	467	47	233	Nil	Nil	Nil	Nil	Nil	141	Nil	700	55	50	...
Total Malay States	...	15,697	19,167	16,976	85,125	12,979	70,509	3	2	12	35	13,952	16,053	73,462	85,288	15,270	19,549	...
STRAITS SETTLEMENTS																		
Malacca ...	...	2,795	1,364	1,195	5,773	(2) 2,420	(2) 10,537	Nil	16,051	Nil	85,253	4,282	Nil	24,547	Nil	2,878	1,375	...
Province Wellesley	...	126	458	461	2,118			Nil		Nil		6,430		31,317		151	532	...
Dindings ...	...	171	80	93	456			Nil		Nil						94	92	...
Penang	1,630	4,986	5	8	37			586		3,703		19,617		90,427		4,476	9	1,025
Singapore ...	1,771	33,378	332	171	918			7,930		39,654						32,470	344	2,118
Total Straits Settlements	3,401	41,456	2,239	1,928	9,302	2,420	10,537	8,516	16,051	43,357	85,253	30,329	Nil	146,291	Nil	40,069	2,352	3,143
TOTAL MALAYA	3,401	57,153	21,406	18,904	94,427	15,399	81,046	8,519	16,053	43,369	85,288	44,281	16,053	219,753	85,288	55,339	21,901	3,143

TABLE II

DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Total
20	21	22	23	24	25	26
Smoked sheet	9,426	18,997	2,809	2,006	769	34,007
Crepe	650	11,599	1,077	743	399	14,468
Unsmoked sheet	1,190	1,874	590	374	777	6,205
Scrap and lump	1,030				370	
Total all Grades	12,296	32,470	4,476	3,123	2,315	54,680

TABLE III

FOREIGN EXPORTS

PORTS	For month	during the year 1931
Singapore ...	29,202	142259
Penang ...	10,403	51,012
Port Swettenham.	4,225	23,690
Malacca ...	451	2,792
MALAYA ...	44,281	219753

TABLE IV

THE PROPORTION OF FOREIGN EXPORTS REPRESENTING DOMESTIC PRODUCTION 4

AREA	For month	during the year 1931
Malay States ...	35,979	176775
Straits Settlements		
MALAYA ...	35,979	176775

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [19A] estimated—[2]—[3]—[4]—[5]—[9]—[10]. For the Straits Settlements, the figure represents purchases by dealers from local estates of less than 100 acres during the month.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25%; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. The proportion of foreign exports representing Malayan domestic production is estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5. The above, with certain omissions, is the Report published by J. I. Miller, M. C. S., Acting Registrar-General of Statistics S.S. and F.M.S., at Singapore on 19th June, 1931.

GENERAL RICE SUMMARY.

May, 1931.

Malaya.—Harvesting was completed in the principal rice growing areas of Perak. In the Krian area 92 per cent. of the padi land was planted, the crop averaging 336 gantangs per acre. The gross crop was 16,482,950 gantangs. Malacca harvests are complete. The crops were good in the Central and Alor Gajah Districts, but poor in the Jasin District.

In Perlis, Negri Sembilan, Selangor and Pahang the preliminary work of cultivation and sowing nurseries is in progress.

The average monthly import of rice into Malaya in 1931 is 44,000 tons compared with 50,000 tons per month in 1930. The average retail price of No. 2 Siam rice in Singapore during May was 32 cents per gantang, compared with 33 cents for the previous month and 50 cents for 1930.

The stocks of rice for the end of April held by wholesalers and retailers in Malaya were estimated to be 47,000 tons.

India.—Total foreign exports of milled rice (as reported by the *Indian Trade Journal* of May 14, 1931) during the first quarter of 1931 amounted to 536,000 tons, compared with 881,000 tons for the same period of 1930.

According to the *Bangkok Times* (May 29, 1931) the Burma export of rice and rice products from January 1st, to May 16th, 1931, was 1,613,000 tons compared with 1,982,526 tons for the same period of the previous year, or a decrease of 17.8 per cent.

Japan.—According to the Ministry of Agriculture and Forestry, stocks of rice in Japan (Proper) on May 1st, the first day of the second half of the present rice-year, amounted to 5,054,688 tons, an increase of 13.1 per cent. compared with the same period last year.

The demand and supply of rice for the second half year, based on the stocks on May 1st, shews surplus assets of 1,731,000 tons of rice. Of this amount, it is estimated that 1,020,000 tons will be this year's surplus carry-over.

Netherlands East Indies.—The area planted with wet rice is practically the same as in 1930. Dry padi land planted this year shews a decrease of about 5 per cent.

The imports into N. E. I. during the first quarter of 1931 were 185,000 tons, being a decrease of 81,000 tons compared with 1930.

Ceylon.—Imports of rice into Ceylon, January to April inclusive, were 149,095 tons against 169,998 tons for the same period in 1930.

Europe.—According to the London Rice Brokers' Association weekly Circular dated May 7th, 1931, the quantities of rice shipped from the East during the period January 1st. to May 7th, was 312,000 tons being an increase of 5.8 per cent. on that for the corresponding period of 1930.

The shipments to the West Indies and America for the first quarter of 1931 were 47,000 tons an average decrease of 28.8 per cent. on that for the corresponding period in 1930.

METEOROLOGICAL SUMMARY, MALAYA. MAY, 1931.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day	Number of days					Total	Daily Mean	Per cent
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation* .01 in or more.	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hr.	hr.	%
Railway Hill, Kuala Lumpur, Selangor ...	92.5	74.4	83.5	96	72	88	77	85.9	86.0	8.64	219.5	2.58	16	12	4	2		213.80	6.90	56
Bukit Jeram, Selangor ...	90.1	74.3	82.2	92	72	87	77	85.9	87.6	20.07	509.8	10.98	19	16	2			232.30	7.49	61
Sitiawan, Perak ...	91.3	74.9	83.1	95	73	85	78	86.5	85.9	3.12	79.3	1.37	13	10	4	1		229.00	7.39	
Kroh, Perak ...	88.0	71.9	79.9	93	69	83	75	83.9	84.1	9.53	242.1	4.52	19	15	1	2		198.65	6.41	
Temerloh, Pahang ...	92.1	73.8	82.9	94	71	83	77	87.1	87.6	5.15	130.8	1.12	16	11	5	7		217.85	7.03	57
Kuala Lipis, Pahang ...	91.1	72.9	82.0	95	70	87	76	84.9	85.5	12.18	309.4	2.16	19	18	22	22	3	200.45	6.47	53
Kuala Pahang, Pahang ...	89.0	75.4	82.2	93	73	81	78	86.0	86.3	2.56	65.0	0.49	19	11	9			219.90	7.09	58
Mount Faber, Singapore ...	88.8	76.5	82.6	94	72	82	80	83.7	84.1	6.96	176.8	1.95	15	15	2			191.30	6.71	51
Butterworth, Province Wellesley ...	89.3	76.5	82.9	92	73	85	79	86.8	86.7	8.14	206.8	3.62	17	10				228.45	7.37	
Bukit China, Malacca ...	86.3	75.0	80.6	90	72	83	77	84.1	85.0	12.59	319.8	2.15	18	15	5			208.95	6.74	55
Kluang, Johore ...	89.8	73.6	81.7	94	70	82	76	83.7	83.7	6.86	174.6	2.24	16	13	3	7		184.10	5.94	49
Bukit Lalang, Mersing, Johore	90.1	73.8	81.9	92	72	81	76	83.9	83.5	9.42	239.3	2.00	16	13	1			208.40	6.72	55
Alor Star, Kedah ...	90.2	75.2	82.7	95	73	81	78	87.9	87.7	4.70	119.4	1.38	17	15				221.60	7.15	58
Kota Bahru, Kelantan ...	92.2	75.5	83.9	96	72	88	78	86.0	86.0	5.68	144.3	2.30	11	7				203.10	6.55	53
Kuala Trengganu, Trengganu	90.6	74.5	82.5	94	72	85	77	86.2	86.8	3.57	90.7	1.22	9	7	7			239.35	7.72	63
HILL STATIONS.																				
Cameron Highlands, Rhodendron Hill, Pahang 5120 ft. ...	73.9	61.2	67.5	78	58	69	63			9.43	239.5	1.60	19	18		2		177.85	5.74	47
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	74.6	58.9	66.7	77	54	71	63	72.2	70.6	9.16	232.7	1.40	20	17		1		169.35	5.46	44
Fraser's Hill, Pahang 4268 ft.	75.8	63.6	69.7	79	61	72	66	73.4	73.8	15.48	393.2	3.34	24	21	9	18	1	177.35	5.72	47

* Precipitation .01 inch or more when measurement is in inches .2mm. or more when measurement is in millimetres.
Compiled from Returns supplied by the Meteorological Branch, Malaya.